Doctor_D
copy

600-76-01146
R-419-F

1-31-83

A Study of the Physicians' Services Market in Pennsylvania

Final Report

REPORTS
R
728
.5
S77
1983

R
728.5
.S77
1983

A Study of the Physicians' Services Market in Pennsylvania

Final Report

January 1983

by

PENNSYLVANIA BLUE SHIELD
RESEARCH DIVISION
Camp Hill, Pennsylvania 17011

This report was prepared pursuant to Contract No. 600-76-0146 between Pennsylvania Blue Shield and the Health Care Financing Administration (HCFA), U.S. Department of Health and Human Services. The HCFA Project Officer for the contract was James R. Cantwell of the Office of Research, Demonstrations and Statistics. The Blue Shield Project Director and Principal Investigator was Gene A. Markel. Views and opinions expressed in this report are those of the authors. No endorsements by the Health Care Financing Administration, the Department of Health and Human Services, or Pennsylvania Blue Shield is intended or should be inferred.

FOREWORD

This is the Final Report on a Pennsylvania Blue Shield study of the physicians' services market in Pennsylvania. Investigations included in various phases of this overall project have addressed empirical patterns of physician price variation; basic physician characteristics, practice characteristics, and locality factors in relation to the explanation of observed price variation; physician response to the Blue Shield participation and Medicare assignment options, including an investigation of factors that may help to explain that response; the role of competition in the determination of physicians' prices and outputs; and an assessment of a variety of alternative physician reimbursement system design options.

The complete Final Report for this project consists of the following parts:

PART ONE: Executive Summary
by Gene A. Markel, Project Director

PART TWO: Descriptive Findings on Physician Price Variation
by Gene A. Markel and Laverne J. Dudley

PART THREE: Factors Related to Physician Price Variation
by Gene A. Markel

PART FOUR: Physician Participation in Insured Medical Programs
by Gene A. Markel

PART FIVE: The Role of Competition in Physician Pricing and Output
by Jerry Cromwell, Ph.D.

PART SIX: Assessment of Alternative Reimbursement System Designs
by Gene A. Markel, David P. Etnoyer and Susan Bunting Bianchi

GENERAL TABLE OF CONTENTS

	Page
FOREWORD	1
TABLE OF CONTENTS FOR PART ONE	5
TABLE OF CONTENTS FOR PART TWO	6
TABLE OF CONTENTS FOR PART THREE	8
TABLE OF CONTENTS FOR PART FOUR	11
TABLE OF CONTENTS FOR PART FIVE	13
TABLE OF CONTENTS FOR PART SIX	15
LIST OF TABLES -- PART TWO	17
LIST OF TABLES -- PART THREE	19
LIST OF TABLES -- PART FOUR	23
LIST OF TABLES -- PART FIVE	24
LIST OF TABLES -- PART SIX	25

PART ONE:	EXECUTIVE SUMMARY	1 - i
PART TWO:	DESCRIPTIVE FINDINGS ON PHYSICIAN PRICE VARIATION	2 - i
PART THREE:	FACTORS RELATED TO PHYSICIAN PRICE VARIATION	3 - i
PART FOUR:	PHYSICIAN PARTICIPATION IN INSURED MEDICAL PROGRAMS	4 - i
PART FIVE:	THE ROLE OF COMPETITION IN PHYSICIAN PRICING AND OUTPUT	5 - i
PART SIX:	ASSESSMENT OF ALTERNATIVE REIMBURSEMENT SYSTEM DESIGNS	6 - i

TABLE OF CONTENTS

		Page
PART ONE:	EXECUTIVE SUMMARY	1- i
I.	OVERVIEW	1- 1
	A. GENERAL BACKGROUND	1- 1
	B. BRIEF DESCRIPTION OF PROJECT STUDIES	1- 4
	C. DATA BASE	1- 5
II.	SUMMARY FINDINGS	1- 8
	A. DESCRIPTIVE PHASE	1- 8
	B. FACTORS RELATED TO PHYSICIAN PRICE VARIATION	1- 11
	C. PHYSICIAN PARTICIPATION IN INSURED PROGRAMS	1- 21
	D. THE ROLE OF COMPETITION	1- 28
	1. Fees	1- 29
	2. Payments	1- 34
	3. Workloads and Intensity	1- 35
	E. ALTERNATIVE REIMBURSEMENT SYSTEM DESIGNS	1- 39
III.	CONCLUSIONS AND RECOMMENDATIONS	1- 46
	COMPOSITE LIST OF REFERENCES	1- 53

TABLE OF CONTENTS

		Page
PART TWO:	DESCRIPTIVE FINDINGS ON PHYSICIAN PRICE VARIATION	2- i
I.	INTRODUCTION	2- 1
	A. SCOPE AND OBJECTIVES	2- 1
	B. SUMMARY OF FINDINGS	2- 3
	C. OUTLINE OF REPORT	2- 5
II.	DATA BASE	2- 6
	A. GENERAL DESCRIPTION OF STUDY DATA BASE	2- 6
	B. DATA QUALITY CONTROL	2- 11
	C. DATA STRATIFICATIONS	2- 14
III.	MEASURES OF PRICING BEHAVIOR	2- 16
	A. PRICING CHARACTERISTICS FOR INDIVIDUAL PHYSICIANS	2- 18
	1. Central Tendency	2- 19
	2. Fee Dispersion	2- 20
	3. Skewness	2- 21
	B. PRICING CHARACTERISTICS FOR GROUPS OF PHYSICIANS	2- 23
	1. Characteristic Price Levels	2- 23
	2. Consistency of Individual Physician Prices	2- 24
	3. Consistency of Collective Pricing Behavior	2- 25
	4. Population Skewness	2- 26
	C. SUMMARY REVIEW OF KEY MEASURES	2- 27
IV.	AGGREGATE FINDINGS	2- 29
	A. PHYSICIAN PRICING FOR BLUE SHIELD COVERAGE	2- 29
	B. PHYSICIAN PRICING FOR MEDICARE PART B SERVICES	2- 38
	C. COMPARISON OF PRICING PRACTICES UNDER MEDICARE AND BLUE SHIELD	2- 42

TABLE OF CONTENTS (PART TWO CONTINUED)

		Page
V.	FINDINGS WITHIN SPECIALTY GROUPS	2- 50
	A. GENERAL AND FAMILY PRACTICE	2- 51
	B. MEDICAL SPECIALTIES	2- 53
	C. SURGICAL SPECIALTIES	2- 56
	D. ANESTHESIOLOGY	2- 60
	E. OTHER SPECIALTIES	2- 63
VI.	FINDINGS BETWEEN SPECIALTY GROUPS	2- 66
	A. VISITS AND CONSULTATION	2- 66
	B. SURGICAL PROCEDURES	2- 69
	C. MISCELLANEOUS/DIAGNOSTIC PROCEDURES	2- 72
VII.	FINDINGS BETWEEN MARKET AREAS	2- 77
	A. VISITS AND CONSULTATION	2- 78
	B. SURGICAL PROCEDURES	2- 83
	C. ANCILLARY/DIAGNOSTIC PROCEDURES	2- 92

TABLE OF CONTENTS

		Page
PART THREE:	FACTORS RELATED TO PHYSICIAN PRICE VARIATION	3- i
I.	INTRODUCTION	3- 1
	A. MEDICAL CARE COSTS AND PHYSICIAN PRICES	3- 1
	B. OUTLINE OF STUDY	3- 9
	C. BRIEF SUMMARY OF FINDINGS	3- 11
II.	CONCEPTUAL BACKGROUND AND STUDY APPROACH	3- 14
	A. THE MARKET FOR PHYSICIANS' SERVICES	3- 14
	1. Early Work: Competition or Monopoly	3- 15
	2. Relation of Physician Supplies to Prices	3- 17
	3. Utility Concepts	3- 18
	4. Excess Demand Theories	3- 20
	5. Physician Induced Demand	3- 21
	6. Agency Relationship	3- 24
	7. Target Income Hypothesis	3- 25
	8. Neoclassical Opposition to Demand Shift Approaches	3- 26
	9. Summary: Is the Physician Services Market Different	3- 29
	B. STUDY APPROACH AND METHODOLOGY	3- 32
	1. Overall Strategy and Study Design	3- 33
	2. Cross-sectional Price Indexes	3- 35
	3. Statistical Breakdowns and Analysis of Variance	3- 37
	4. Regression Analysis	3- 40
III.	DATA BASE AND STUDY VARIABLES	3- 41
	A. PRELIMINARY REDUCTION OF VARIABLES	3- 43
	B. PHYSICIAN PRICE VARIABLES	3- 44
	C. BASIC PHYSICIAN CHARACTERISTICS	3- 44

TABLE OF CONTENTS (PART THREE CONTINUED)

		Page
	D. ADDITIONAL PRACTICE CHARACTERISTICS	3- 46
	E. PRACTICE LOCALE (COUNTY) VARIABLES	3- 51
IV.	FINDINGS: ANALYSIS OF VARIANCE ON PHYSICIAN AND PRACTICE FACTORS	3- 56
	A. PRICE VARIATION ASSOCIATED WITH BASIC PHYSICIAN CHARACTERISTICS	3- 58
	1. Variation Within Lines of Business (Market Segments)	3- 58
	2. Variation Within Broad Specialty Groupings	3- 70
	B. PRACTICE CHARACTERISTICS	3- 83
	1. Variation Within Lines of Business (Market Segments)	3- 84
	2. Variation Within Broad Specialty Groupings	3- 96
V.	FINDINGS: ANALYSIS OF VARIANCE ON LOCALITY FACTORS	3-111
	A. PHYSICIAN PRICE VARIATION BETWEEN GEOGRAPHIC AREAS	3-111
	B. PRACTICE LOCALE CHARACTERISTICS IN RELATION TO PRICES	3-114
	C. PRACTICE LOCATION FACTORS WITHIN SPECIALTY COHORTS	3-122
	D. RELATION OF PHYSICIAN SUPPLIES TO RELATIVE PRICE LEVELS	3-137
	E. URBAN BIAS	3-143
	F. PRICES AND LOCALITY FACTORS OUTSIDE CENTRAL PHILADELPHIA	3-148
VI.	FINDINGS: MULTIVARIATE ANALYSIS	3-168
	A. FINDINGS FOR THE OVERALL PHYSICIAN POPULATION	3-171

TABLE OF CONTENTS (PART THREE CONTINUED)

		Page
B.	FINDINGS FOR SELECTED BROAD SPECIALTY-ORIENTED COHORTS	3-178
	1. Primary Care Physicians	3-178
	2. Medical Specialists	3-181
	3. Surgical Specialties	3-184
	4. Comparisons Across and Between Specialty Cohorts	3-187
VII.	SUMMARY AND DISCUSSION OF FINDINGS	3-195
	A. GENERAL RECAP AND OVERVIEW OF FINDINGS	3-195
	B. CONCLUSIONS ON THE NATURE OF THE MARKET	3-208
	C. POLICY IMPLICATIONS	3-213
	REFERENCES	3-218

TABLE OF CONTENTS

		Page
PART FOUR:	PHYSICIAN PARTICIPATION IN INSURED MEDICAL PROGRAMS	4- i
I.	INTRODUCTION	4- 1
A.	PENNSYLVANIA BLUE SHIELD REIMBURSEMENT SYSTEMS	4- 3
B.	MEDICARE REIMBURSEMENT AND ASSIGNMENT	4- 6
C.	SUMMARY OF FINDINGS	4- 8
II.	CONCEPTUAL AND ANALYTICAL FRAMEWORK	4- 11
A.	PREVIOUS STUDIES OF ASSIGNMENT AND PARTICIPATION	4- 11
1.	Conceptual Model of Market	4- 12
2.	Implications and Expected Results from Theory	4- 13
3.	Alternative Market Model for Blue Shield Participation	4- 16
4.	Empirical Results and Findings from Previous Studies	4- 17
B.	SCOPE AND ANALYTICAL APPROACH FOR PRESENT STUDY	4- 19
III.	DATA BASE	4- 22
A.	DATA BASE FOR STUDY OF ASSIGNMENT AND PARTICIPATION	4- 23
B.	REDUCED VARIABLE LIST FOR ANALYSIS OF VARIANCE	4- 25
1.	Dependent Variables	4- 25
2.	Basic Physician Characteristics	4- 26
3.	Individual Physician Practice Characteristics	4- 27
4.	Practice Locale (County) Variables	4- 31
IV.	FINDINGS: MEDICARE ASSIGNMENT	4- 38
A.	ASSIGNMENT RATE VARIATION BY GENERAL PHYSICIAN CHARACTERISTICS	4- 41

TABLE OF CONTENTS (PART FOUR CONTINUED)

		Page
B.	ANALYSIS BY PRACTICE CHARACTERISTICS	4- 49
	1. Medicare Practice Characteristics	4- 50
	2. Overall Practice Characteristics	4- 53
	3. Average Fee Levels Assigned and Unassigned	4- 56
C.	ANALYSIS OF CHARACTERISTICS OF PRACTICE LOCALE	4- 57
	1. General Demographic and Socioeconomic Factors	4- 59
	2. Medical Services Economy	4- 63
	3. Health Care Insurance and Subsidization Factors	4- 65
V.	FINDINGS: BLUE SHIELD PARTICIPATION	4- 68
A.	PARTICIPATION BY GENERAL PHYSICIAN CHARACTERISTICS	4- 69
B.	ANALYSIS OF PRACTICE CHARACTERISTICS	4- 73
	1. Blue Shield Practice Characteristics	4- 74
	2. Overall Practice Characteristics	4- 77
C.	ANALYSIS BY CHARACTISTICS OF PRACTICE LOCALE	4- 80
	1. General Demographic and Socioeconomic Factors	4- 82
	2. Medical Service Economy	4- 84
	3. Health Care Insurance and Subsidization Factors	4- 86
VI.	SUMMARY AND DISCUSSION OF RESULTS	4- 89
A.	REVIEW OF FINDINGS	4- 89
B.	DISCUSSION OF RESULTS	4- 95
C.	POLICY IMPLICATIONS	4- 98
	REFERENCES	4-101

TABLE OF CONTENTS

		Page
PART FIVE:	THE ROLE OF COMPETITION IN PHYSICIAN PRICING AND OUTPUT	5- i
I.	STATEMENT OF THE PROBLEM	5- 1
	A. INTRODUCTION AND OBJECTIVES	5- 1
	B. BACKGROUND	5- 4
	C. SUMMARY OF FINDINGS	5- 8
	1. Fees	5- 9
	2. Payments	5- 15
	3. Workloads and Intensity	5- 17
	D. OVERVIEW OF STUDY	5- 20
II.	REVIEW OF THE INDUCEMENT LITERATURE	5- 21
	A. SUMMARY OF LIMITATIONS OF PRE-1978 LITERATURE	5- 21
	B. TRENDS IN THE INDUCEMENT LITERATURE SINCE 1977	5- 23
	C. SUMMARY OF MAJOR CONTRIBUTIONS	5- 37
	D. ASSESSMENT OF RECENT ADVANCES	5- 39
	E. THE ROLE OF THE PENNSYLVANIA BLUE SHIELD STUDY	5- 40
III.	ANALYTIC FRAMEWORK	5- 42
	A. GENERAL THEORY OF DEMAND CREATION	5- 42
	B. A PHYSICIAN-SPECIFIC INDUCEMENT MODEL	5- 46
	C. STATIC AND DYNAMIC REDUCTIONS	5- 49
IV.	PBS DATA BASE AND VARIABLE SPECIFICATION	5- 51
	A. LONGITUDINAL CLAIMS FILE	5- 51
	B. SCOPE AND CRITERIA FOR INCLUSION	5- 51

TABLE OF CONTENTS (PART FIVE CONTINUED)

		Page
	C. ANALYTIC PROCEDURE AND SUMMARY FILES	5- 52
	D. CHARGE, UTILIZATION, AND EXPLANATORY VARIABLES	5- 57
	E. STRENGTHS AND WEAKNESSES OF DATA BASE	5- 61
V.	DESCRIPTIVE FINDINGS	5- 63
	A. ORGANIZATION OF CHAPTER	5- 63
	B. PHYSICIAN WORKLOADS AND CHARGES BY GEOGRAPHIC AREA	5- 64
	C. CHARGES, UTILIZATION RATES, AND WORKLOADS BY PHYSICIAN CHARACTERISTIC	5- 66
	D. TRENDS IN PHYSICIAN CHARGES AND PATIENT UTILIZATION RATES	5- 72
VI.	ECONOMETRIC FINDINGS	5- 90
	A. EQUATION SPECIFICATION	5- 90
	B. DEPENDENT AND INDEPENDENT VARIABLES	5- 92
	C. FUNCTIONAL FORM AND ESTIMATION METHOD	5- 95
	D. ECONOMETRIC FINDINGS: SUMMARY FILE	5- 97
	E. ECONOMETRIC FINDINGS: THIRTEEN PROCEDURES	5-108
	REFERENCES	5-121

TABLE OF CONTENTS

		Page
PART SIX:	ASSESSMENT OF ALTERNATIVE REIMBURSEMENT SYSTEM DESIGNS	6- i
I.	INTRODUCTION	6- 1
	A. SUMMARY OF PROBLEM	6- 2
	B. OUTLINE OF STUDY AND REPORT	6- 4
II.	GENERAL BACKGROUND	6- 5
	A. MEDICARE REIMBURSEMENT IN PENNSYLVANIA	6- 5
	1. Area Differentiation	6- 5
	2. Specialty Differentiation	6- 7
	B. BASIC ISSUES	6- 8
	C. MEDICARE ECONOMIC INDEX	6- 9
	D. PROPOSED TALMADGE AMENDMENT	6- 10
III.	OVERVIEW OF APPROACH AND STUDY DESIGN	6- 12
	A. SUMMARY OF SIMULATED SYSTEM DESIGN OPTIONS	6- 12
	B. STATISTICAL SUMMARIZATION OF SIMULATED OUTCOMES	6- 15
IV.	SIMULATION METHODOLOGY	6- 17
	A. DATA BASE	6- 17
	B. DATA CLEANING AND FILE PREPARATION	6- 18
	C. LEVEL I (CUSTOMARY) PROFILES	6- 19
	D. LEVEL II (PREVAILING) PROFILES	6- 21
	E. CLAIMS PAYMENT AND PRICING MODEL	6- 23

TABLE OF CONTENTS (PART SIX CONTINUED)

		Page
V.	AGGREGATE FINDINGS	6- 27
	A. IMPACT OF SPECIALTY DIFFERENTIATION	6- 30
	B. IMPACT OF AREA DIFFERENTIATION	6- 31
	C. FEE SCHEDULE OPTIONS	6- 33
	D. EFFECT OF INDEXING	6- 34
	E. EFFECT OF PROPOSED TALMADGE AMENDMENT	6- 35
VI.	DISTRIBUTIVE EFFECTS	6- 37
VII.	SUMMARY DISCUSSION	6- 54
APPENDIX TO PART SIX:	DETAILED TABLES OF FINDINGS FOR SELECTED DATA BREAKDOWNS	6- 58
	List of Part Six Appendix Tables	6- 59

LIST OF TABLES -- PART TWO

Table	Title	Page
2- 1	Statewide Average Physician Prices and Pricing Characteristics for Selected Services Covered by Blue Shield (1975)	2- 30
2- 2	Statewide Average Physician Prices and Pricing Characteristics for Selected Services Covered by Medicare Part B (1975)	2- 39
2- 3	Comparison of Blue Shield and Medicare Statewide Average Prices for Selected Physician Services	2- 43
2- 4	Comparative Characteristics of Blue Shield and Medicare Prices for Selected Services Performed by Physicians in General/Family Practice	2- 52
2- 5	Comparative Characteristics of Blue Shield and Medicare Prices for Selected Services Performed by Physicians in Medical Specialties	2- 54
2- 6	Comparative Characteristics of Blue Shield and Medicare Prices for Selected Services Performed by Physicians in Surgical Specialties	2- 57
2- 7	Comparative Characteristics of Blue Shield and Medicare Prices for Selected Services Performed by Anesthesiologists	2- 61
2- 8	Comparative Characteristics of Blue Shield and Medicare Prices for Selected Services Performed by Physicians in Other Specialties	2- 64
2- 9	Pricing Characteristics by Specialty Group for Selected Kinds of Physician Visits and Consultation	2- 67
2-10	Pricing Characteristics by Specialty Group for Selected Surgical Procedures	2- 70
2-11	Pricing Characteristics by Specialty Group for Selected Miscellaneous/Diagnostic Procedures	2- 73
2-12	Comparative Characteristics of Blue Shield and Medicare Prices for Brief Office Visit, by Metropolitan Area	2- 79

LIST OF TABLES (PART TWO CONTINUED)

Table	Title	Page
2-13	Comparative Characteristics of Blue Shield and Medicare Prices for Intermediate Hospital Visit, by Metropolitan Area	2- 80
2-14	Comparative Characteristics of Blue Shield and Medicare Prices for Comprehensive Consultation, by Metropolitan Area	2- 81
2-15	Ratios of Metropolitan Area Average Price Levels for Selected Visits and Consultation, Relative to Statewide Average Prices	2- 82
2-16	Relative Price Units for Selected Surgical Procedures Under Blue Shield, by Metropolitan Area	2- 85
2-17	Ratios of Average Prices by Metropolitan Area, Relative to Statewide Average Prices, for Selected Surgical Procedures under Blue Shield	2- 87
2-18	Mean CV for Selected Surgical Procedures Under Blue Shield, by Metropolitan Area	2- 89
2-19	CV of Medians for Selected Surgical Procedures Under Blue Shield, by Metropolitan Area	2- 90
2-20	Key to Procedure Numbers for Tables 16, 17, 18 and 19	2- 91
2-21	Comparative Characteristics of Blue Shield and Medicare Prices for Chest X-Ray, by Metropolitan Area	2- 93
2-22	Comparative Characteristics of Blue Shield and Medicare Prices for Upper GI, by Metropolitan Area	2- 94
2-23	Comparative Characteristics of Blue Shield and Medicare Prices for EKG, by Metropolitan Area	2- 95
2-24	Comparative Characteristics of Blue Shield and Medicare Prices for Urinalysis, by Metropolitan Area	2- 96
2-25	Comparative Characteristics of Blue Shield and Medicare Prices for FBS, by Metropolitan Area	2- 97

LIST OF TABLES -- PART THREE

Table	Title	Page
3- 1	Average Annual Increases for Selected CPI Components and Time Periods	3- 3
3- 2	Sample Distribution Parameters for Selected Practice Characteristics (1975)	3- 50
3- 3	Distribution Parameters for Selected Locality Characteristics (c. 1975)	3- 55
3- 4	Statistical Parameters of Price Index Distribution	3- 56
3- 5	Physician Price Index Quintiles, by Line of Business	3- 58
3- 6(a)	Mean Aggregate Price Indexes for Physicians' Services by Selected Physician Characteristic Breakdowns	3- 59
3- 6(b)	Mean Blue Shield Price Indexes for Physicians' Services, by Selected Physician Characteristic Breakdowns	3- 61
3- 6(c)	Mean Medicare Price Indexes for Physicians' Services, by Selected Physician Characteristic Breakdowns	3- 63
3- 7(a)	Mean Aggregate Price Indexes for Physicians in General and Family Practice by Selected Physician Characteristic Breakdowns	3- 71
3- 7(b)	Mean Aggregate Price Indexes for Physicians in Medical Specialties by Selected Physician Characteristic Breakdowns	3- 73
3- 7(c)	Mean Aggregate Price Indexes for Physicians in Surgical Specialties by Selected Physician Characteristic Breakdowns	3- 75
3- 7(d)	Mean Aggregate Price Indexes for Physicians in Other Specialties by Selected Physician Characteristic Breakdowns	3- 77

LIST OF TABLES (PART THREE CONTINUED)

Table	Title	Page
3- 8(a)	Mean Practice Characteristics, by Aggregate Price Index Quintiles	3- 85
3- 8(b)	Mean Practice Characteristics, by Blue Shield Price Index Quintiles	3- 86
3- 8(c)	Mean Practice Characteristics, by Medicare B Price Index Quintiles	3- 87
3- 9(a)	Mean Practice Characteristics of General and Family Practice Physicians, by Aggregate Price Index Quintiles	3- 97
3- 9(b)	Mean Practice Characteristics of Medical Specialists, by Aggregate Price Index Quintiles	3- 98
3- 9(c)	Mean Practice Characteristics of Surgical Specialists, by Aggregate Price Index Quintiles	3- 99
3- 9(d)	Mean Practice Characteristics of Other Specialists, by Aggregate Price Index Quintiles	3-100
3-10	Mean Physician Price Indexes, by Urbanized Areas Within Lines of Business	3-112
3-11	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles	3-115
3-12(a)	Mean Characteristics of Practice Locales (County Level) by Aggregate Price Index Quintiles, for General and Family Practice Physicians Only	3-123
3-12(b)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Medical Specialists Only	3-125
3-12(c)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Surgical Specialists Only	3-127
3-12(d)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Other Specialists Only	3-129

LIST OF TABLES (PART THREE CONTINUED)

Table	Title	Page
3-13	Correlation of Physician's Aggregate Relative Price Levels with Physician Supply for Selected Specialty Group Cohorts	3-139
3-14	Comparative Locality Characteristics for Philadelphia County (Philadelphia Inner City), Allegheny County (Pittsburgh), and Remainder of Pennsylvania	3-146
3-15	Pearson Correlations of Locality Characteristics with Aggregate Price Index for State of Pennsylvania With and Without Major Urban Counties	3-147
3-16	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, Philadelphia County Omitted	3-149
3-17(a)	Mean Characteristics of Practice Locales (County Level) by Aggregate Price Index Quintiles, for General and Family Practice Physicians Only, Philadelphia County Omitted	3-155
3-17(b)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Medical Specialists Only, Philadelphia County Omitted	3-157
3-17(c)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Surgical Specialists Only, Philadelphia County Omitted	3-159
3-17(d)	Mean Characteristics of Practice Locales (County Level), by Aggregate Price Index Quintiles, for Other Specialists Only, Philadelphia County Omitted	3-161
3-18	Correlation of Physicians' Aggregate Relative Price Levels with Physician Supply for Selected Specialty Group Cohorts, Philadelphia County Omitted	3-167

LIST OF TABLES (PART THREE CONTINUED)

Table	Title	Page
3-19	Price Regression Coefficients: Pennsylvania With and Without Central Philadelphia, by Insured Market, All Direct Patient Care Physicians	3-172
3-20	Price Regression Coefficients: Pennsylvania With and Without Central Philadelphia, by Insured Market, Primary Care Physicians	3-179
3-21	Price Regression Coefficients: Pennsylvania With and Without Central Philadelphia, by Insured Market, Medical Specialists Physicians	3-182
3-22	Price Regression Coefficients: Pennsylvania With and Without Central Philadelphia, by Insured Market, Surgical Specialist Physician	3-185

LIST OF TABLES -- PART FOUR

Table	Title	Page
4- 1	Personal and Practice Characteristics of Pennsylvania Physicians	4- 32
4- 2	Practice Locale (County) Characteristics and Distribution Parameters	4- 36
4- 3	Medicare Assignment by Selected Physician Characteristics	4- 43
4- 4	Mean Percent of Line Items Assigned, by Specialty Group and Board Certification	4- 47
4- 5	Mean Percent of Line Items Assigned, by Specialty Group and Number of Associates	4- 47
4- 6	Medicare Practice Characteristics, by Medicare Assignment Rate	4- 51
4- 7	Overall Practice Characteristics, by Medicare Assignment Rate	4- 54
4- 8	Comparative Characteristics of Physicians' Practice Locales (County Level), by Medicare Assignment Rate	4- 60
4- 9	Blue Shield Participation, by General Physician Characteristics	4- 70
4-10	Blue Shield Practice Characteristics, by Plue Shield Participation Status	4- 75
4-11	Overall Practice Characteristics, by Blue Shield Participation Status	4- 78
4-12	Comparative Characteristics of Physicians' Practice Locales (County Level), by Blue Shield Participation Status	4- 83

LIST OF TABLES -- PART FIVE

Table	Title	Page
5- 1	Longitudinal Study Files: Procedures, Number of Physicians, and Relative Value	5- 54
5- 2	Charge, Payment, Utilization, and Explanatory Variables	5- 59
5- 3	Average Physician Blue Shield-Plus-Medicare Workloads and Fees, Deflated, by Metro Area by Degree of Physician Concentration	5- 66
5- 4	Weighted Charges, Payments, Workloads, and Utilization Rates by Practice Characteristic by Physician Density, 1975	5- 68
5- 5	Weighted Charges and Payments by Year by Physician Age Decile	5- 71
5- 6	Weighted Charges by Specialty by Physician Density, 1973-1978	5- 74
5- 7	Weighted Utilization Rates by Specialty by Physician Density, 1973-1978	5- 75
5- 8	Physician Charges, Deflated, and Patient Utilization Rates by Physician Area by Year by Procedure	5- 79
5- 9	Physician Charges, Deflated, and Patient Utilization Rates by Physician Area by Year by Specialist, Selected Ancilarry Procedure	5- 88
5- 10	Regression Results: Summary File, Fees, Utilization Rates, and Workloads	5- 99
5-11	Regression Results: Summary File, Fees by Specialty Group, Participation Status	5-100
5-12	Regression Results: Individual Procedure Files; Fees (In LOGS)	5-110
5-13	Regression Results: Individual Procedure Files; URT (In LOGS)	5-114
5-14	Physician Competition and Inflation for Fee Utilization Equations - 13 Selected Procedures	5-117

LIST OF TABLES -- PART SIX

Table	Title	Page
6- 1	Summary of Design Options	6- 14
6- 2	Summary of Aggregate Simulated Payout Effects	6- 28
6- 3	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Selected Specialties	6- 46
6- 4	Projected Percent Change In Beneficiary Liability Due to Change from Current UCR System, by Selected Specialties	6- 46
6- 5	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Type of Service	6- 47
6- 6	Projected Percent Change in Beneficiary Liability Due to Change from UCR System, by Type of Service	6- 47
6- 7	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Metropolitan Area Class	6- 48
6- 8	Projected Percent Change in Beneficiary Liability Due to Change from UCR System, by Metropolitan Area Class	6- 48
6- 9	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Physician Density in Locale	6- 49
6-10	Projected Percent Change in Beneficiary Liability Due to Change from Current UCR System, by Physician Density in Locale	6- 49
6- 11	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Physician Age	6- 50
6-12	Projected Percent Change in Beneficiary Liability Due to Change from Current UCR System, By Physician Age	6- 50

LIST OF TABLES (PART SIX CONTINUED)

Table	Title	Page
6-13	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Size of Medicare Patient Roster	6- 51
6-14	Projected Percent Change in Beneficiary Liability Due to Change from Current UCR System by Size of Medicare Patient Roster	6- 51
6-15	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Proportional Revenue from Medicare	6- 52
6-16	Projected Percent Change in Beneficiary Due to Change from Current UCR System, by Proportional Revenue from Medicare	6- 52
6-17	Projected Percent Change in Allowed Charges Due to Change from Current UCR System, by Assignment Rate	6- 53
6-18	Projected Percent Change in Beneficiary Liability due to Change from Current UCR System, by Assignment Rate	6- 53
	List of Part Six Appendix Tables	6- 59

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part One:

Executive Summary

By: Gene A. Markel,
Project Director

I. OVERVIEW

This project has addressed a variety of issues and questions concerning the market for physicians' services in Pennsylvania. The scope of the overall project has included studies of physician pricing patterns, characteristic pricing behaviors, factors related to physician pricing practices, econometric analyses of the market, physician participation with Blue Shield, and Medicare assignment. The studies have emphasized use of empirical physician price and quantity data derived from paid claims history files for Medicare Part B and private Blue Shield claims submitted to Pennsylvania Blue Shield.

A. GENERAL BACKGROUND

The rapid growth in health care costs and in the prices of medical care in recent years has often been noted. Total expenditures for health care in the United States are estimated to have been $247 billion for the year 1980 (Gibson and Waldo, 1981). This was 9.4 percent of the gross national product for that year. The corresponding expenditures in 1950 and 1955 represented a comparatively much more modest 4.4 percent of a smaller gross national product. A substantial share of this expenditure is for physicians' services.

Inflation, specifically in the market for physicians' services, also has been much noted. In the fifteen-year period immediately preceding the start-up of Medicare, physicians' fees increased at an average annual rate of 3.2 percent, compared to an overall inflation rate of 1.8 percent as

indicated by the all items Consumer Price Index (CPI). After the inauguration of the Medicare program, there was a dramatic increase in physician fee inflation, along with a general inflationary increase in the national economy as a whole. In the immediate past decade (1971-1981), the average annual increase in physicians' fees has been 8.8 percent, compared to 8.6 percent for the overall CPI. These phenomena have prompted great interest in obtaining an improved understanding of the physicians' services market -- including, in particular, better understanding of the process by which physicians' prices and output levels are set.

In a review of the literature up to 1978, performed as one of the earlier tasks in this project (Juba, 1979), it was observed and concluded that the market for physicians' services does not seem particularly responsive to "normal" supply and demand pressures; hence, it is not clear (in theory) how projected increases in physicians per capita will affect prices. Empirical evidence observed in that review suggested that output per physician decreases as the local supply of doctors increases. Also, some data showed that physicians' fees may increase when the local supply of physicians increases.

It also was noted that physicians' fees seem positively related to the level of insurance coverage. This is especially true when the insurance coverage permits physicians to charge patients for that portion of fees not paid for by the insurance carrier. Hence, it was concluded that the potential exists for an inflationary trend in physicians' fees under any federal health insurance program unless some control measures to mitigate fee inflation are included in the plan.

An updated literature review performed in conjunction with a subsequent task under this project (Cromwell, Part Five of this Final Report), characterizes 1978 as a watershed year for research on the physicians' services market and observes the following as major drawbacks of the work prior to 1978:

(1) Inaccurate measurement of physician fees and area utilization;
(2) Inadequate consideration of nonprice competition;
(3) Incomplete adjustments for confounding demand and supply variables;
(4) Insufficient development of an alternative theoretical paradigm explaining demand inducement;
(5) Inadequate consideration of disequalizing forces in the physician services markets; and
(6) Insufficient analysis of backward-bending supply.

Much of the work since 1978 has centered on the question of physician-induced demand, attempting to determine whether this phenomenon actually exists. If it does, the implications are enormously significant. The question of physician-induced demand provides much of the focus for analytical work done in this project.

B. BRIEF DESCRIPTION OF PROJECT STUDIES

The major elements of the project, each represented as one part of the Final Report, were: (1) a descriptive study of the patterns of physicians' pricing practices and of the patterns of physician price variation in Pennsylvania; (2) a cross-sectional study of factors related to physician price variation; (3) a cross-sectional study of Blue Shield participation and Medicare assignment among Pennsylvania physicians; (4) a longitudinal cross-section study of the role of competition in relation to the determination of physician price and output levels in the market; and (5) an assessment of alternative physician reimbursement system designs.

The first of these was essentially an exercise in data acquisition, data organization and descriptive statistics. Individual physicians' pricing patterns were described in terms of their basic statistical parameters -- viz., means and/or medians, coefficients of variation, and skewness. Similar statistics were employed in describing pricing behavior in populations or cohorts of physicians. Comparisons were made between different specific procedures, between different specialty-oriented cohorts of physicians, between different geographic areas, and between Blue Shield and Medicare prices.

The cross-sectional study of factors related to physician price variation used analysis of variance and multivariate regression analysis methods to isolate factors of apparent importance in relation to physicians' relative price levels. The analysis again considered differences between various broad specialty-oriented cohorts, between

geographic areas, and between the Blue Shield and Medicare markets. The cross-sectional study of Blue Shield participation and Medicare assignment in Pennsylvania was similarly structured, but did not employ any multivariate analysis.

The longitudinal cross-section study of the Pennsylvania physicians' services market concentrated primarily upon the issue of physician-induced demand in the market. The study employed data spanning a relatively recent six-year period, 1973-1978, and included a variety of descriptive and econometric work.

The final component task area involved a study of alternative physician reimbursement system designs. Fifteen alternative designs were set forth, employing varying degrees and combinations of specialty recognition and area recognition in the determination of allowable fee levels. The analysis covered both usual, customary, and reasonable (UCR) system designs and fee schedule system designs in a simulation mode which produced key output measures for each option tested.

C. DATA BASE

An extensive data base of detailed information on prices and quantities of services delivered by physicians was compiled for this study, and provided one of the study's great strengths.

Data were collected and developed at the level of the individual physician for more than 11,000 Pennsylvania physicians. These price and quantity data were extracted from claims transaction files created in connection with claims processing operations at Pennsylvania Blue Shield

covering both the Medicare Part B and private Blue Shield programs. The study focused upon forty-four representative, well-defined, and frequently performed procedures in a 1975 time frame. The selected procedures, although relatively few in number, account for nearly 40 percent of all services for all procedures in Pennsylvania Blue Shield's private Blue Shield business, and more than half of all services for all procedures reported to the company under Medicare Part B. Physicians represented in the data base are all those who reported claims within a given line of business (i.e., Medicare or Blue Shield) for at least ten services for any of the forty-four criterion procedures during the year 1975. In total, the price and quantity data base developed for physicians' services in this study contained close to six million individual transaction records.

A matched data base of individual physician characteristics and selected practice characteristics also was developed. Drawing upon American Medical Association (AMA) and American Osteopathic Association (AOA) reference sources, as well as upon various in-house company files, nearly 10,000 physicians from the price and quantity data file were matched to produce an extensive and detailed composite file of physician characteristics, practice characteristics, and related price data.

In addition, a file was developed containing more than sixty variables describing each of Pennsylvania's sixty-seven counties. Information in the county data file was attached to the individual physician characteristics file by virtue of knowledge of the county in which each physician practices. These county level data were used as the best available information to characterize each physician's practice locale.

The complete data set supporting these studies contained approximately 150 data items for each of 9,827 Pennsylvania physicians, spanning personal physician characteristics, practice characteristics, and characteristics of practice locale for each individual physician. Of the 9,827 physicians represented in the data base, 8,322 (84.7 percent) were represented for private Blue Shield experience; 9,102 (92.6 percent) had Medicare experience; and 7,597 (77.3 percent) had experience in both lines of business.

II. SUMMARY FINDINGS

This section summarizes findings from each of the major project phases covered in detail in the other five parts of this Final Report.

A. DESCRIPTIVE PHASE

The purpose of this phase of work was to detect, describe, and summarize patterns of variation in Pennsylvania physicians' fees. These descriptive results -- in addition to being interesting in and of themselves -- served to suggest further generalizations, conjectures, or insights concerning physicians' pricing practices.

Methodologically, the primary emphasis was upon measures of central tendency and dispersion in the distributions of physicians' fees for selected specific procedures and services performed by physicians. Starting with data developed at the level of the individual physician, empirical patterns of pricing behavior were examined for: (a) the overall statewide physician population; (b) cohorts of physicians organized according to broad specialty classes; and (c) cohorts of physicians organized by geographic areas which might be viewed as loose approximations of macro-scale market areas within the state.

The question of price discrimination by physicians was of particular interest here. At the individual physician level, the investigation of this issue simply sought to determine whether there is demonstrable evidence that individual physicians charge different prices to different patients, or to different classes of patients, for the same services. At

the population (or cohort) level, it attempted to detect evidence of the extent to which there are characteristic price differences between physicians, or between groups of physicians, for essentially the same services. These questions were addressed in a general and inferential sense through interpretation of statistical measures of dispersion in the fee data distributions.

The objectives of this phase may be summarized as follows:

(1) To determine and display characteristic relative price levels for each of several selected representative procedures performed by physicians;

(2) To detect evidence of possible price discrimination for specific procedures at the individual physician level;

(3) To obtain some measure of the relative homogeneity or disparity between different physicians in their characteristic pricing practices for like services;

(4) To obtain quantitative measures of differences in prices charged to Medicare beneficiaries and to Blue Shield subscribers for (nominally) the same services;

(5) To examine within-group and between-group variations in pricing practices by broad specialty groups, for selected specific procedures;

(6) To examine differences (or similarities) in physicians' pricing practices by geographic area.

In general, the results revealed substantial variation in fees charged for most procedures. The observed variation is in some ways systematic, and in some ways a bit haphazard. The findings reflect the already well known fact that specialists charge more for their services than generalists. The extent of the specialist fee differential varies, however, for different kinds of services. Moreover, although there always is at least one specialty group with higher average fees than generalists for any given procedure, the generalist group does not always have the very lowest fees. There are certain procedures for which the generalist group ranks in the mid-price range.

There is clear evidence of differences in price between the Medicare and Blue Shield programs. These differences often are very slight and are not entirely consistent, however. Medicare tends to have slightly lower prices for diagnostic medical and pathology services; but the results are mixed for other types of services, with Medicare prices sometimes higher and sometimes lower than those for Blue Shield.

For most procedures, there is scant evidence of significant price discrimination at the individual physician level, particularly in the Blue Shield program. On the other hand, the summary statistics for many of the procedures reflect somewhat greater dispersion of fees at the individual physician level in the Medicare data than in the Blue Shield data. These results suggest that while there is relatively little discrimination in either program at this level, there is a slightly greater tendency toward at least a modest amount of price discrimination with Medicare beneficiaries than with Blue Shield patients.

As expected, there is fairly extensive fee variation between physicians; but for most procedures this variation does not appear to be excessive. Agreement between physicians on fee levels appears to be relatively higher for anesthesia services, for most definitive surgical procedures, and for some radiology. The least agreement is exhibited for hospital visits, for diagnostic surgical procedures commonly performed in the office setting, and for some pathology services. As would be expected, the level of agreement for many, but not all, procedures is higher when controlling for specialty group.

Also as expected, prices for physicians' services tend to be highest in the Philadelphia urban area. Contrary to expectation, however, prices in the Pittsburgh urbanized area tend on the whole to be relatively moderate. Rural areas are not always the lowest in price.

B. FACTORS RELATED TO PHYSICIAN PRICE VARIATION

This topic was studied in a cross-sectional mode, using analysis of variance and regression analysis techniques. The regressions were used to produce reduced form price equations. Rather than dealing in terms of prices for individual procedures, the price variables here were single-valued aggregate price relatives.

The analysis of variance (ANOVA) found that 18 percent of the variance in individual physicians' prices is accounted for by the physician's specialty. Even at the level of broad specialty class cohorts -- defined as generalist physicians, medical specialists, surgical specialists, or other specialists -- broad specialty class accounts for 11

percent of the variance in physicians' prices. Specialty status generally is regarded as an indicator of higher quality; and if it may be presumed that consumers of physicians' services seek quality, this then could become a demand-related factor, which ordinarily would be expected to be translatable to higher prices for the provider with such credentials. In this regard, specialists of all kinds were found to have relative price levels that, on the average, are 22.3 percent higher than generalist physician prices. This is fairly consistent with the price premium for specialty status found in the Medicare market segment alone; but specialty status in the Blue Shield market segment brings a somewhat smaller reward, with the relative price levels for specialists of all kinds being only 16 percent higher than generalists' prices. These figures, while accurate at face value, may be somewhat overstated as the "pure" price increment attributable to specialty and to specialty alone, since ANOVA also captures indirect effects. The regression analysis adds findings to indicate that medical specialists command prices 11.5 percent higher than the average for all other physicians (including other kinds of specialists) in the aggregate Blue Shield and Medicare Part B market for physicians' services, 11.9 percent higher in the Blue Shield market, and 12.8 percent higher in the Medicare market. For surgical specialists, the price premium for specialty credentials is 9.9 percent in the aggregate market, 9.1 percent in the Blue Shield market, and 11.7 percent in the Medicare market.

Another indicator of quality is board certification, which then also should act as a demand-related factor and should be translatable into higher prices for the physician with such credentials. The breakdown

analysis conducted in conjunction with the analysis of variance confirms this, indicating that physicians with board certification standing have prices 14.5 percent higher than the prices of those who are not board certified. Regression analysis also showed this to be a positive factor in relation to physicians' prices, but indicated the price differential for board certification credentials as a relatively much more modest 6.0 percent. The apparent discrepency here can be explained by assuming that the regression analysis captured the essentially "pure" effect, while the ANOVA captured a number of indirect effects as well. In that sense, both results would be correct.

Other factors commonly construed as being related to the quality of medical care have to do with the physician's medical education. In particular, foreign medical graduates (FMGs) are generally regarded as having a medical education inferior to that of U.S. medical school graduates; and osteopathic (D.O.) physicians, whether justified or not, are often regarded as having training inferior to that of M.D. physicians. If, indeed, the FMG and the D.O. have inferior training, then this should act as a negative quality indicator and also should act as a negative demand factor in the eyes of most informed consumers. FMG and D.O. prices accordingly should be lower than those of other physicians, all other things being equal. This is not the case. The ANOVA found the gross price difference between FMG and U.S. medical graduate physicians to be 8.1 percent, with the FMG having the higher prices. The comparatively more pure effect isolated by the regression analysis still showed the FMG's price levels to be 5.5 percent higher, ceteris paribus. In both the ANOVA and regression analysis results, higher prices for FMG physicians

are found to hold through all broad specialty-oriented cohorts. The anticipated negative price impact for the lesser quality of care sometimes presumed to be provided by osteopathic physicians also is contradicted by the empirical findings. From the regression results, D.O. physicians are found to have prices that are 11.1 percent higher in the Blue Shield market, 3.9 percent higher in the Medicare market, and about 6.0 percent higher in the aggregate market statewide.

The physicians' age also is sometimes taken as a quality-related factor, on the premise that the mid-career physician should be expected to be delivering the highest quality services. Under this assumption, younger physicians are regarded as lacking the experience to deliver the best quality services, and older physicians are regarded as having obsolescing skill and/or knowledge levels. The findings, however, both from ANOVA and from regression analysis, are that the relationship of the physician's age to prices of services is strictly monotonic and negative. Thus, the oldest physicians tend to have the lowest prices, and the youngest tend to have the highest prices, with an orderly and steady progression in between. ANOVA results showed the youngest ten percent of physicians to have prices 26 percent higher than those of the oldest ten percent of physicians in the aggregate market. It is, of course, not really clear that the physician's age should be taken as a negative demand-related facet of the quality of services delivered. In many cases, the older physician may have cultivated patient-physician relationships that more than compensate for any possible obsolescence of skills in the perception of the medical services consumer.

The physician who is a member of his national professional association (AMA or AOA) tends to be a lower priced physician. Regression analysis indicated this differential to be 3.6 percent in the aggregate market for all physicians statewide. Physicians who participate with Blue Shield were found to have relative price levels on the order of 6.4 percent lower overall, compared to nonparticipating physicians. Under Medicare, physicians who consistently take assignment have prices some 14 percent higher than physicians who consistently decline assignment.

Physicians who practice in collaboration with other physicians are found in all cases to have higher prices than solo physicians. Regression analysis indicated that the physician who has at least one associate will have price levels approximately three percent higher than solo physicians. ANOVA, although probably somewhat overestimating the effect, showed that those who practice in groups of 15 or more have prices 22 to 24 percent higher than those in solo practice. The tendency for physicians with more associates to have higher prices is found in every specialty cohort.

Other practice characteristics taken into consideration in this study were found to be generally weak in explaining the variability in relative price levels between different individual physicians. Overall, measures of practice size or physician output showed little relationship to physicians' price levels. Measured in terms of raw annual numbers of services delivered, or in terms of total annual dollar volume of billings (deflated by both the local CPI and the individual physician's relative price index, in which case the resulting deflated annual dollar volume might serve as a reasonably good measure of the physician's real output for the year), there was no significantly detectable relationship between

physicians' activity levels and their prices. A positive, but very slight, relationship was found between the physician's relative price level and the size of his active patient roster for the year. The intrinsic value of services delivered by a physician also was found to have no meaningful or sizeable relationship to the prices he charges for services performed in common with other physicians having practices with different typical intrinsic valuations for services delivered. (In simpler terms, there is no significant difference between doctors who typically perform "big ticket" services and doctors who typically perform "nickel and dime" services in terms of prices they respectively charge on the average for whatever services they may both perform.) The one practice factor showing a bit of relationship to physicians' prices was the intensity of services delivered per patient. In general, the tendency is for physicians delivering fewer services per patient to charge higher prices, or conversely, for those delivering more services per patient to charge lower prices. The service intensity factor was relatively weakly related to price, however. Whatever the magnitude or significance of the effects they may have, factors generally describing the size, volume, or activity level of the practice exhibit as positively related factors, and the intensity of services appears as a negatively related factor.

Another factor that may be attached to the individual physician, although it is more an imposed factor than one which he controls, is the proportion of his Blue Shield claim line items reimbursed under usual, customary, and reasonable (UCR) methods of reimbursement. This is of interest because UCR reimbursement methods have increasingly come to be regarded as instruments of price inflation in the physicians' services

market. The argument generally put forth by critics is essentially that, once the physician comes to understand how UCR really works, it can become for all practical purposes a "blank check," offering ample opportunities for financial exploitation if the physician so chooses. The UCR reimbursement method also is quite generally regarded as inflationary from the perspective that it actually may encourage physicians to raise their prices in order to stay ahead of the time lags in the UCR system's response to an inflationary economy. Conceptually and intuitively, these arguments for the inflationary impacts attributable to UCR reimbursement seem compelling. Even if these things are in fact happening in Pennsylvania, however, the empirically observed facts in this study fail to support that conclusion. Perversely (perhaps), physicians' prices in Pennsylvania are found to be related negatively to the proportional volumes of their Blue Shield claims reimbursed under UCR. That is, physicians who have greater proportions of UCR claims tend to have lower prices, and vice versa. This is true for all broad specialty cohorts, as well as for the overall physician population.

A substantial part of the variation in Pennsylvania physicians' prices is manifested in terms of geographic areas. Not surprisingly, the highest prices in the state tend to be found in Philadelphia, the state's largest major metropolitan area; and the lowest prices tend generally to be found in rural areas. Curiously, prices of physicians' services in the Pittsburgh area, while somewhat high, are not as high as might be expected for a major metropolitan area. Beyond the expected differences between places like Philadelphia, Pittsburgh, and rural Pennsylvania, there is additional diversity in the state's several lesser metropolitan areas.

Some of them appear to have higher prices than those found in Pittsburgh; and a few others, at least in some insured markets, appear to have generally lower physicians' price levels than are found in purely rural areas. Overall, ANOVA indicated that 14.5 percent of the variance in Pennsylvania physicians' prices is attributable to geographic area of practice, at the county level.

While it is clear that there is price diversity from area to area, it is less clear what accounts for these area-based price differences. Both in analysis of variance and in regression analysis, the socioeconomic and demographic characteristics of various areas failed to account very strongly for the price differences between areas. Nevertheless, there are some generalizable patterns. From the ANOVA, the locality characteristics most strongly associated with physicians' price levels appeared to be the input of Medicare money to the local physicians' services economy, the locally projected CPI, the population density, and the supplies of medical specialists and primary care physicians relative to population size. In general, urbanization -- encompassing a number of typical features of urbanism in addition to mere density of population -- appears to be an important influence. All of the above are found to be related positively to physicians' prices -- i.e., physicians' prices increase in association with quantitative increases in each of these factors. Per capita income, while also related positively, did not appear in ANOVA as a very strong factor. Nor did the proportions of elderly people in the population or the general educational attainment levels of the population. The proportion of laborers found in the composition of the workforce exhibited a modest relationship to physicians' prices, which has been interpreted

here as possibly having a cultural component as well as an income-related component. Among some typical operating cost factors, local rents were found to have a slight relationship to price levels, but the variable used to represent physicians' office staff costs showed no noticable relationship to their relative price levels.

It was demonstrated that Philadelphia County, constituting the inner city part of the greater Philadelphia urbanized area, differs greatly from the rest of Pennsylvania in almost every way. Further, it was demonstrated that the inclusion of Philadelphia County in the analyses introduces a substantial urban bias into the results. When center city Philadelphia is omitted, factors related to urbanization become less important and some of the conventional economic forces become a bit more effective.

Quantitative econometric findings from the regression analysis are consistent with, and generally confirm, the specific findings and market tendencies suggested by the ANOVA. To reduce the problems arising from multicollinearity between independent variables, however, the regression analysis included only a relatively small number of locality-related factors -- specifically, the included variables were population density, per capita income, composite dollar inputs from health insurance programs (Blue Shield, Medicare B, and state sources), and county-level supplies of physicians in various cohorts. In general, the effects of demand-related locality variables in the econometric analysis were found to be positive, but small.

Regarding physician supplies, the analysis of variance and accompanying correlation data showed a clear positive relationship of physician supply to physicians' prices, both overall and by broad specialty-oriented cohorts. Primary care physicians and medical specialists showed a rather strong relationship between their relative price levels and supplies of physicians within their own cohorts. Generalist physicians and surgical specialists, on the other hand, showed no significant relationships of their prices to supplies of physicians of their own kind.

Significant cross-specialty relationships were found. In these crossover relationships between supplies and prices in various cohorts, generalist physicians were found to be the most affected by supplies of other kinds of physicians, while medical specialists were the least affected. On the other side of this, generalist physician supplies were found to have the least relationship to prices of physicians in other cohorts, while medical specialist supplies had the greatest relationship to prices of physicians of other kinds. Surgeons' prices appeared to respond to supplies of complementary physician types, including both medical specialists and primary care physicians. Presumably these act as sources of referrals for surgical services.

The general patterns of supply-to-price relationships revealed in the ANOVA seemed to reflect a comparatively strong and influential position for medical specialists in the overall market for physicians' services. This particular observation, however, was not supported by the regression findings. Medical specialist supplies, when taken into account in the multivariate regression, had no significant impact. Otherwise the

regression analysis generally supports the ANOVA, simply providing further and more finely refined quantification of effects of physician supplies upon prices. Overall, in the aggregate market statewide, the prices of all direct patient care physicians were found to have an elasticity of about .10 in response to supplies of general and family practice physicians, and a substantially smaller elasticity with respect to proportional medical specialist supplies. On preliminary trials, the prices for all direct patient care physicians (as a composite population) failed to respond in any orderly way to the overall physician supply or to supplies of surgeons.

C. PHYSICIAN PARTICIPATION IN INSURED PROGRAMS

A descriptive and analytic approach was taken to seek out empirical patterns in Blue Shield participation and Medicare assignment, to identify and explore factors related to physicians' participation and assignment decisions, and to differentiate the characteristics of those who do and those who not participate and take assignment. Beyond the purely descriptive elements of this study task, the basic approach was an analysis of variance.

Overall, from the extensive and representative physician sample used as a base for this study, it was estimated that Pennsylvania physicians on the average take assignment on 37.7 percent of the Medicare line items for which they are reimbursed, representing 45.1 percent of their billed charges under the Medicare program. The distribution of physicians with respect to their Medicare assignment rates tends toward a bipolar

response. Most physicians either consistently accept assignment or consistently decline assignment. Relatively few are in the middle of the assignment response distribution, where physician response to the assignment option can be characterized as most ambiguous and uncertain.

For Blue Shield programs, the study results estimated 87.5 percent of physicians to be participating with Blue Shield in the state of Pennsylvania. This is somewhat higher than would be found by reference to the PBS physician masterfile, which over the past several years has indicated physician participation rates in the neighborhood of 80 percent. A great many of the physicians listed in the company masterfile rarely or never submit claims, however, and the 87.5 percent participation rate found in the study probably is a reasonably good estimate for physicians actually submitting Blue Shield claims with some regularity.

The major part of the study effort was devoted to determining patterns of participation and assignment, to differentiating the characteristics of those who do and do not participate or take assignment, and to developing insights into factors influencing physicians' assignment and participation decisions. The results of this effort reveal strikingly different physician response and factor association patterns for the Blue Shield participation decision, as compared to the Medicare assignment decision.

In terms of general physician characteristics, it was found that specialists have Blue Shield participation rates that are lower than those of general practitioners; but in the Medicare program, the result is precisely the opposite. In the Medicare market, specialists' assignment rates are higher than those of general practitioners. Theoretically, one

would expect to find the result observed in the Blue Shield program. This is based on the argument that specialist credentials are perceived as an indicator of quality; and that the quality of services offered by a physician acts as a demand variable, with higher quality increasing demand in the open market and correspondingly giving the physician more opportunity and motivation to serve that market, foregoing the assigned and/or participating markets. Results obtained by others on this point have been somewhat mixed, but have tended on the whole to conform to theory.

With board certification credentials being similarly viewed as an indicator of quality, the same argument would lead to an expectation of lower participation and assignment rates for board certified physicians. This was the observed result for Blue Shield participation; but again, the opposite result was observed for Medicare assignment in Pennsylvania. Other researchers who have evaluated this factor have rather uniformly found the theoretically expected result -- i.e., lower participation and assignment rates for board certified physicians.

Diametrically conflicting results also were obtained in the relation of the physician's age to assignment and participation. The results for Blue Shield participation showed a very orderly and well defined relationship, with participation increasing as the physician's age increases. Medicare assignment rate, on the other hand, was shown to decrease as the physician's age increases, in an equally orderly and well defined relationship. Theoretical implications associated with the physician's age are somewhat unclear, depending upon the specific assumptions one makes concerning the concomitants of age and experience.

An area of agreement in study results was on the effects of FMG status. FMGs were found to have higher Blue Shield participation and higher Medicare assignment rates. This is consistent both with theory and with previous findings by others.

Another area in which there was at least partial agreement was on the effect of the number of physician associates with whom a physician is involved in his practice. Physicians in medium to large size groups were found to have greater Blue Shield participation and greater rates of Medicare assignment. The results were mixed, however, on the effects of being associated with only a small number of other physicians. Physicians practicing with one to three physician associates have the lowest Blue Shield participation, but have a relatively high rate of Medicare assignment.

In looking at some key factors used to characterize a physician's practice, substantial differences again were found. Larger patient rosters are associated with higher Medicare assignment, but lower Blue Shield participation. Larger annual dollar volume is associated with higher Medicare assignment and lower Blue Shield participation. Physicians who deal in higher-valued services and physicians whose relative price levels are higher also have higher Medicare assignment, but lower Blue Shield participation. Larger relative cut-backs from billed to allowed charge were found to diminish Blue Shield participation, but not to reduce Medicare assignment. One area of agreement was in the annual total volume of services delivered and the intensity of services per patient. Increases in either of these factors were associated with increases in both Blue Shield participation and Medicare assignment. A

further difference, however, was in the apparent relative strength of the effects identified. The strength of the effect upon Medicare assignment was quite strong for some factors, but all of the observed effects upon Blue Shield participation were substantially weaker.

The effects of practice locality characteristics were much more uniform than the disparate, and often opposing, effects described above for basic physician characteristics and physician practice characteristics. Among the general demographic and socioeconomic factors, higher population density, a more liberal political orientation, higher levels of poverty and unemployment, and relatively downgrade social and economic indicators all were found to exert a positive (increasing) effect upon both Blue Shield participation and Medicare assignment. The observed effects upon Medicare assignment were relatively weak, but for Blue Shield participation they were even weaker, often nearly negligible.

Blue Shield participation and Medicare assignment rate responses were in agreement for price, cost, and supply factors used in characterizing the medical services economy in a practice locality. Increases in hospital bed supply and in the number of primary care physicians in a locality were associated with higher rates for both assignment and participation. Both Blue Shield participation and Medicare assignment failed to exhibit any clear relationship to other physician supply variables. There also was agreement that office wage factors had little or no effect upon either Blue Shield participation or Medicare assignment. There was slight disagreement on the effects of generally higher price levels for medical services in an area. Medicare assignment showed an upward response to generally higher medical services prices, but Blue

Shield participation showed no response. Again, the Medicare assignment effects were weak, and the Blue Shield participation effects were almost negligible.

Finally, there was general agreement on the effects of health care insurance and subsidization factors. These effects can be summarized with the generalization that assignment and participation tend to be higher in areas where there are higher volumes of health insurance payment dollars and higher levels of government expenditure for medical programs. There is a curious area of disagreement in one specific component of this effect, however. A greater Blue Shield presence in the market -- whether measured in terms of absolute subscriber enrollment counts, relative penetration as a percentage of local population, or benefit payment dollars -- is associated with higher levels of Medicare assignment; but a greater Blue Shield presence in a local market does not generate any increase in physician participation with Blue Shield.

Some of the observed results tentatively suggest that individual physicians exhibit a greater inclination to participate in areas where there is a generally higher level of physician participation with Blue Shield, and that they also exhibit an inclination to higher levels of assignment acceptance in areas where there is generally higher physician assignment acceptance. It may be that this is merely an illusion arising from a tautological relationship between the locality variables and individual physician variables describing assignment/participation in the data base; or it may validly be reflecting a disposition of individual physicians to conform to the behavior patterns of their peers in their assignment and participation decisions.

There are indications of behavioral crossover between physicians' Blue Shield participation decisions and Medicare assignment decisions. This is evidenced by results suggesting that physicians who participate with Blue Shield have a predisposition also to accept assignment on Medicare. Blue Shield participating physicians have an average Medicare assignment rate that is more than twice as great as the assignment rate for nonparticipating physicians (40.4 percent, compared to 18.8 percent).

In an overview by broad classes of factors, it appears that Medicare assignment is related more to basic individual physician attributes and practice characteristics than to characteristics of practice locale. Practice characteristics describing size and volume of practice, as well as the relative value of services delivered, appear to have particularly strong influence upon the assignment decision. The physician's specialty alone is a strong determinant, accounting for 14.5 percent of the variance in assignment rates. Practice locale (at county level) accounts overall for a relatively much smaller 7.9 percent of variance, with specific characteristic factors for locality on the whole showing much weaker influence than the specific factors used to characterize practices.

The potential explanatory relationships appear in general to be weaker for Blue Shield participation than for Medicare assignment. As in the case of Medicare assignment, a greater amount of variance is explained by specialty than by practice locale (county); but for Blue Shield participation these variables explain a mere 4.1 percent and 3.7 percent, respectively. The explanatory power of factors describing individual practice characteristics in relation to Blue Shield participation appears very weak.

D. THE ROLE OF COMPETITION

The issue of physician-induced demand was explored in this phase of study using a longitudinal data file derived from Pennsylvania regular Blue Shield business plus Medicare claims reimbursements over a six-year period, 1973-1978. Charges, payments, workloads, and patient utilization (or intensity) rates were determined on a per procedure basis for 23 selected procedures: 11 surgical; 6 visits; and 6 nonsurgical diagnostic tests. The data base included claims from a panel of 8,099 physicians, each performing at least one of the 23 procedures continuously throughout the six years. Aggregate price and quantity indices for each physician were calculated using data from all 23 procedures, with relative prices forming the aggregation weights. Finally, all pecuniary data were deflated by a regional cost-of-living index, although no explicit time-series deflator was used because of the lack of such an index on a substate basis. Thus, aggregate price and payment data reflect regionally (but not temporally) deflated prices per Relative Value Unit (RVU), while workloads and intensity are in terms of RVUs per physician and per patient. Systematic differences in physician prices and output, therefore, cannot be attributed either to service mix or to regional cost effects.

The analysis included a variety of descriptive and econometric work, ordered from the most aggregated (physician) level to the most disaggregated (procedure) level. Findings are summarized by topic area (e.g., fees) and by type of analysis (descriptive, econometric).

1. Fees

Overall fees per RVU rose 9.1 percent per year, from $5.92 per RVU in 1973 to $8.60 in 1978. Econometrically adjusting for trends in demand (e.g., income, insurance coverage), the rate of fee inflation was still about 6.5 percent. The biggest adjusted yearly increase (9 percent) came in 1975, the year after wage-price controls were removed.

Absolute fees per RVU varied directly with the extent of physician concentration. In areas with the highest physician-population (MDPOP) ratio, charges per RVU in 1975 were $7.36, a full 14 percent above the average charge in low MDPOP areas ($6.48).

Fees per RVU rose at about the same, undeflated, 9 percent per annum in all areas, essentially independent of physician concentration. Nor was any measure of physician availability correlated with weighted fees per RVU in the aggregate fee regressions.

From these results it is concluded that the presence of more physicians per capita, while not raising fees overall, does not depress fees either. The lack of strong negative correlation has serious implications for future Medicare and health care expenditures on physicians' services, what with the rapid growth in supply projected through 1990.

Fee levels and trends varied both by specialty and by procedure. Obstetricians and gynecologists had by far the highest fees per RVU, followed by surgical specialists (e.g., neurosurgeons, orthopedic surgeons, and ophthalmologists), medical specialists (e.g., cardiologists, pediatricians, neurologists), and other specialists (e.g., psychiatrists,

radiologists, pathologists). General practitioners had the lowest charges per RVU, about 25 percent below OB-GYNs, and 12.7 percent below the surgical/medical specialists, holding other variables like board certification constant.

The rate of fee inflation was highest, as well, for OB-GYNs (57 percent over five years), while other specialists exhibited the lowest rate (38 percent); GP fees per RVU rose 42 percent; general surgeons, 51 percent.

Fee inflation, while not differing by specialty across high, medium, and low physician-population (MDPOP) market areas, does show an absolute widening of the fee gap. For example, GP fees per RVU were $.76 higher in high MDPOP areas than low areas in 1973, the gap widening to $1.20 by 1978. Such gaps cannot be explained either by specialty or procedure mix, nor can they be attributed to regional cost-of-living differentials.

Among the individual procedures, tonsillectomy fees rose the fastest, 13.3 percent yearly, followed by vaginal deliveries and D&Cs, at 12.9 percent. Lens excisions and resection of prostate surgery had the lowest increases among surgical procedures, 8.7 and 9.3 percent, respectively.

Fee inflation for office and hospital visits was somewhat lower, averaging between 7.5 and 11.0 percent annually. A definite shift away from brief to intermediate office or hospital visits was observed, however, leaving constant the number of visits per patient seen, even though the physicians' average revenue per visit increased. This upgrading, however, contributed only to the rate of inflation in

expenditure per visit, due in part to the slower growth in intermediate visit fees relative to brief visits.

The six diagnostic tests exhibited the lowest inflation rates, ranging from 3.6 percent (complete blood count) to 6.5 percent (upper GI) per year. In 1973, the six tests averaged $21.28 per patient seen, increasing to $26.22 in 1978, a 25 percent increase.

While the rate of fee inflation for individual procedures was generally uncorrelated with the extent of physician competition, absolute fees, regionally adjusted for cost-of-living, were positively related to MDPOP, although not for every procedure. Differentials for OB-GYN procedures and urinalysis proved to be much greater than for other procedures.

Econometric results holding exogenous supply and demand factors constant, while showing no competitive effects on overall fees, did exhibit definite effects when disaggregated by specialty or procedure. For the sample of 2,584 GPs and FPs, average fees per RVU were lower in areas where these physicians were more plentiful relative to the population. The effect, however, is relatively small: a doubling of GPs per capita reduces average GP fees per RVU about $.34, an elasticity of .06. Offsetting this negative own supply effect on GP fees is a positive, statistically significant cross-price effect of non-GPs; that is, non-GPs practicing in areas with more physicians per capita charge higher fees, thereby diluting much of the effect of own-specialty competition. This finding is consistent with previous work by Steinwald and Sloan (1974).

Results from the medical and surgical equations reveal some additional evidence of inducement. The relative supply of medical

specialists was found to be positively related to average medical specialists' fees per RVU (an elasticity of .037), while the relative number of direct patient care physicians was positively correlated with surgical fees (an elasticity of .02), although the own-specialty effect was insignificant. GP supplies, by contrast, were negatively correlated with medical specialists' fees (an elasticity of .09). Apparently for specialists, fee competition is not direct among peers, but rather, manifests itself indirectly through interspecialty competition. More specifically, increases in GPs per capita, holding specialist supplies constant, do depress both GP and specialist fees -- particularly for medical specialists like internists, pediatricians, dermatologists, and allergists. The rapid phasing out of GPs in favor of specialists does not bode well for the future in terms of competitively lower fees through supply increases alone. Changes in reimbursement arrangements also may be necessary.

Regressions also were run on Medicare-assigning and non-assigning physicians. The results showed that:

- Non-assigning physician fees per RVU were slightly lower than for assigners (holding specialty, etc. constant); however,
- Fees per RVU rose much faster for non-assigning physicians (40 vs. 27 percent); also,
- Fees of assigning physicians were significantly higher in high MDPOP areas, ceteris paribus; furthermore,
- Medicare Part B expenditures per capita were positively correlated with average fees, particularly for non-assigning physicians.

While this last relationship may not be strictly causal, it nonetheless emphasizes the importance of constraining physician fees in some way to arrest Medicare outlays. Also, no evidence is found that physician supplies reduce fees Medicare must pay; in fact, the results suggest the opposite.

Thirteen procedure regressions were run on selected surgical, medical, and diagnostic services. In six of the regressions where MDPOP was significant, it was always positive, especially for pathology tests, office and hospital visits, and tonsillectomies. The first could be taken as evidence in favor of Reinhardt's hypothesis that diagnostic testing may be more inducible, although apparently only for pathology tests (at least of the diagnostics examined).

MDPOP proved to be consistently related in a positive way to all three types of visits: brief and intermediate office, and intermediate hospital. In previous research this anomalous finding has been attributed to either: (a) non-price competition, or (b) greater reduced fees and bad debts, neither of which has been addressed in this study. If physicians in highly competitive areas provide longer visits (which they do) or other important amenities, then interarea charges are not strictly comparable. Whether third parties should be responsible for paying for such amenity-induced differences is certainly arguable. Physicians may also choose to keep stated price artificially high for reimbursement purposes, knowing they will be discounted by both patients and insurors. While we do not know about patient collection rates, we do know that Blue Shield and Medicare payments are higher in more competitive areas (discussed below).

Finally, as in earlier work, supplies of GPs per capita were negatively related to fees for four procedures (tonsillectomies, chest x-rays, brief office visits, and urinalyses), and were positively related for one (Colles fractures).

2. Payments

Physician charges generally are not paid in full by either Blue Shield or Medicare, and it is possible that reimbursement screens used by Pennsylvania Blue Shield could equalize relative charges across areas and specialists. Such, however, is not the case.

Blue Shield/Medicare payments per RVU were about one dollar less than charges on average, a 16 percent reduction. Payment differentials across high and low MDPOP areas were somewhat less than for charges, 9 versus 14 percent, but clearly they had not been eliminated. In 1975, the average charge per RVU was $7.36 in high MDPOP areas while average payments were $6.02, an 18 percent reduction. The corresponding figures for low MDPOP areas were $6.48 and $5.54, a 15 percent reduction.

Rates of reduction differed somewhat by broad specialty group, although payments, too, were invariably higher in more physician-dense areas. For GPs and other specialists (e.g., radiologists), the rates of reduction were 14 and 17 percent, respectively, irrespective of geographic areas. For medical and surgical specialists, the relationship between payments and billed charges did tend to reflect a greater degree of fee reduction in high MDPOP areas, implying at least an implicit attempt to narrow the fee gap. Payment/fee ratios for these specialists were approximately .85 in low MDPOP areas compared to .80 in high MDPOP areas.

Payments in high MDPOP areas were still 5-8 percent above those in low MDPOP areas, however.

Fees and payments per RVU both declined uniformly with physician work experience, which seems anomalous if there is a positive return to learning-while-practicing -- at least until skills begin to obsolesce. Physicians in the youngest decile were charging $9.18/RVU compared to only $8.68 for physicians in the prime working years, age 47-49. Payment reduction rates were more or less constant across age cohorts, which is to be expected given UCR reimbursement based on fees.

Part of the discrepancy may be explained by increasing specialization among younger physicians; but even in fee regressions, fees per RVU exhibited a negative, L-shaped relationship with years of work experience. Ceteris paribus, fees fall rapidly across younger physician cohorts, bottoming out in the later years of practice. Thus, simple negative correlation of fees with physician age cannot be completely explained by specialty or procedure mix, cost-of-living differentials, demand factors, or other physician credentials. And although UCR methods of reimbursement do place certain constraints on payments to new market entrants, they apparently are not adequate to equalize payment rates across physicians with identical characteristics except for years in practice.

3. Workloads and Intensity

A third area of investigation included physician workloads and intensity of care per patient. Primarily at issue here is the relationship between physician competition, work effort (or productivity),

and patterns of care. Neither workloads nor patient intensity uniquely capture physician inducements, for utilization may result not from demand shift, but from a downward movement along an unchanged demand curve as prices fall. The fact that no inverse relationship was found between MDPOP and fees per RVU, on the other hand, allows us to draw stronger conclusions than we otherwise might.

Physician Blue Shield/Medicare workloads (i.e., RVUs/physician) rose at an annual rate of 2.3 percent compared to a rate of 9.1 percent for fees. Medical specialists had the highest workloads, double those of GPs. The relatively low GP workloads are expected, given their lower internalized ancillary care and Blue Shield non-coverage of routine, preventive care.

Workloads exhibited an inverted U-shape with both physician age and MDPOP, being highest for physicians aged 43-49 practicing in areas of medium physician availability. Workloads were lower in both low and high MDPOP areas, which may be attributable to lower Blue Shield penetration in rural areas and a smaller, pro rata demand in urban, physician-dense areas. When other variables like specialty were held constant, however, workloads showed a consistent, negative relationship with MDPOP, which is expected if more physicians are having to compete for relatively fewer patients. Physicians presumably offset some of their lost output by setting higher fees.

An interesting relationship exists between workloads and fees across MDPOP areas. The product of the two gives total Blue Shield and Medicare charges for the 23 procedures. Under simple competitive assumptions, we would expect both workloads and fees to be lower where

physicians are more abundant, yet we already know this to be untrue: workloads are lower (at least in high MDPOP areas), but fees are higher. In most instances the two effects offset each other, resulting in nearly constant total charges per physician. Only the Other Specialists group shows a broad deviation across areas, due to their relatively high workloads in medium MDPOP areas. Of course, such relationships may be coincidental and Blue Shield penetration and urban/rural demand does vary systematically by market area. Total charges of physicians in low MDPOP areas may be relatively "low" because fewer patients have Blue Shield coverage while workloads in high MDPOP areas are "higher" than expected given a simple prorating of demand because of greater medical need. Still, it is remarkable that the average physician in high MDPOP areas submits bills for essentially the same Blue Shield/Medicare total amounts even though there are 2.5 times as many physicians per capita as in low MDPOP areas.

The last area of investigation involved the intensity of care delivered per Blue Shield or Medicare patient seen in any year. Under greater competition, physicians would be expected to have to "share" patients more in terms of referrals and services delivered, as well as simply seeing fewer of them. They may try to compensate for this competitive sharing effect by recommending more intensive care (e.g., more hospital and office visits, more lab tests, more x-rays).

A real problem in analyzing intensity over time is presented by non-repetitive surgery, which imparts a downward bias to all intensity measures where it is included. Only limited statements about inducement can be made given this caveat. For example, both tonsillectomies and lens

excisions declined rapidly as a percent of patients seen for our physician panel, yet fees rose much more rapidly for the former, non-repetitive procedure. While absolute demand for tonsillectomies has been falling nationwide, it has not been falling for lens excisions. Any one physician group, however, will show a declining excision rate as they perform the procedure on a shrinking number of candidates unless offset by new patients. In Pennsylvania, the number of elderly who form the primary pool for lens excision grew far faster than the number of ophthalmologists, actually resulting in an almost constant eligible pool. Adjusting for this gives a nearly constant surgery rate, thereby reducing physician pressures to raise fees to offset declining demands -- as hypothesized to be the case with tonsillectomies.

Trends in intensity were generally negative, reflecting the dominance of non-repetitive surgery, with a few important exceptions. Intensity actually increased for general surgeons and other specialists practicing in high MDPOP areas. As other specialists like pathologists and radiologists perform non-repetitive services for the most part, it is not too surprising that their intensity rose, particularly as they depend upon referrals from many other specialties; but a rise in intensity per patient seen for surgeons is quite unexpected in light of the strong downward bias in the measure for this group. One explanation might be that in surgeon-dense areas, general surgeons have an increasing tendency to practice like GPs and internists, with many more office visits and ancillaries. A less sanguine interpretation would suggest that they perform more unnecessary, elective surgery (e.g., tonsillectomies, herniorrhaphies) to maintain target incomes. Only a much more detailed

investigation of their practice patterns across market areas could discriminate between the two hypotheses.

Most of the ancillary tests showed positive trends in intensity, headed by complete blood count and urinalyses at 4.1 and 3.2 percent annually, respectively. Upper GIs and EKGs actually had slight declines. Ancillary procedure intensity was much higher in high MDPOP areas than elsewhere: chest x-rays (28 percent of patients seen in low MDPOP areas versus 36 percent in high MDPOP areas); EKGs (31 versus 51 percent); and urinalyses (31 versus 46 percent). How much of this discrepancy is attributable to greater internalization of production in high MDPOP areas is unknown, but it is unlikely to account for such wide disparities. Nor can the difference be attributable to specialty mix, as ancillary intensity rates were similar within specialty.

E. ALTERNATIVE REIMBURSEMENT SYSTEM DESIGNS

A number of health insurance carriers and programs, including the Medicare Part B program and Pennsylvania Blue Shield, make reimbursement on claims for physicians' services through an approach known as "usual, customary, and reasonable" (UCR). In brief, the UCR system operates by keeping on file individual doctors' "usual" charges for all kinds of specific services on which they report claims with reasonable frequency, while also maintaining files of the "customary" charges for several peer groups of physicians. The customary charge serves the purpose of defining a cut point beyond which a physician's charge would be considered excessive, even if it is within the range of his usual charge. The

general rule is for a physician's usual charge to be defined as the median of the actual billed charges reported during a recent time period, and for the customary to be defined as the value at some specified percentile of the distribution of usual charges for all physicians comprising a peer group. The system adjudicates a reimbursement allowance on a UCR claim by allowing as "reasonable" the smallest of: (a) the physician's actual billed charge showing on the claim; (b) his own usual charge of record; or (c) the recorded customary charge for his peer group. Provision is made for special reviews on claims alleged to be for cases in which there were unusual or extenuating clinical circumstances to justify greater than usual payment. The files of usual and customary charges, generally referred to as "profiles," are updated periodically.

In the design and development of a UCR system, there are a number of points where administrative discretion and/or alternative basic design features may offer various options for the system. This investigation considered one aspect of these available options -- specifically, an exploration of some of the alternatives that could be used in designing and applying peer group structures as they would relate to the determination of customary charges. In general, physician peer groups for reimbursement purposes are defined on the basis of the physician's specialty and location of practice. A variety of strategies could, and have, been used by Medicare carriers and private insurers to classify physicians' charges by area and/or specialty for these purposes.

A number of basic design options were specified for this phase of study, spanning some of the principal categorical choices for the use of physician specialties and/or geographic areas in the design of peer groups

to be used in determining customary charges in a UCR system. The approach taken to compare and assess these options was to simulate the payment (or allowance) adjudications that would be made under each option and accumulate statistics on the comparative payouts and other performances of the various options.

The results demonstrated very little net impact assignable to specialty differentiation or to area differentiation within the range of options considered. In general, those changes that were indicated were in the direction of slightly increased overall allowed charges when specialties are recognized; and, with one exception, similarly slight increases occured as a result of geographic area differentitation. Overall net changes in beneficiary liability associated with both kinds of differentiation were projected to be practically negligible. Unfortunately, all of the specialty or area differentiations in this experiment were tested in the context of the Medicare Economic Index environment, so that variations in outcome that may have been intrinsically associated with different degrees of area or specialty recognition inevitably were damped. A more faithful test of system responses to area or specialty recognition features would have been obtained if the economic indexing feature were omitted from the simulations.

A look was taken at some of the more detailed effects that could be associated with a change from Pennsylvania Blue Shield's present kind of UCR structure -- which recognizes four different classes of areas and many different specialties -- to each of four broadly representative types of alternative system designs. In this, it was found that a change to a UCR

system based upon statewide pooling of all doctors in all specialties for reimbursement purposes would reduce allowed charge levels for physicians in nearly every specialty. Characteristically high charging specialties would be impacted the most; and general practitioners actually would see a slight increase in allowed charges. The change to a statewide UCR system, however, would not have a really great quantitative impact on allowed charges for any specialty. By area, the greatest decreases would be seen in those areas with the highest population density (major metropolitan areas), and in those areas with the greatest density of physicians relative to population (generally also the major metropolitan areas).

Beneficiary liability under statewide UCR would change very little for the patients of physicians in most kinds of specialties. The greatest changes would be increases of 1.6 percent for ophthalmologists' services and 4.1 percent for the services of OBGs. Beneficiary liability for independent labs would decrease 1.7 percent; and all others would decrease by one percent or less. When projected onto broad generic types of service, the beneficiary liability changes are very similar for all types of service. By type of area, however, beneficiary liability increases far more dramatically in lesser metropolitan areas than in any other kind of area -- 17.7 percent, compared to 0.6 percent increase in major metro areas and a decrease of 0.9 percent in rural areas. Beneficiary liability under a change to statewide UCR also shows the greatest decreases at places where there are the greatest supplies of physicians. The liability is highest for patients of doctors with the largest Medicare patient rosters and for patients of doctors who derive

the greatest proportion of their revenues from Medicare. This is significant, of course, because it says that the greatest impact occurs precisely where it touches the greatest number of beneficiaries.

A change to a fee schedule based upon 75th percentile charges generally was projected to increase allowed charge levels while also tending to decrease beneficiary liabilities. The allowed charge increases here would most benefit general practitioners and physicians in family practice, with increases of approximately six percent. By area, the benefits of the 75th percentile fee schedule would be greatest for physicians in lesser metro and rural areas, again with allowed charge increases in the neighborhood of six percent. Beneficiary liabilities would be decreased the most for services of general and family practice physicians, and for services of podiatrists. Somewhat smaller, but still fairly sizable, decreases are shown for services of physicans in internal medicine, hematology, orthopedic surgery, ophthalmology, and urology. All of these commonly provide relatively large numbers of services for the elderly population. However, beneficiary liability increases 2.4 percent for independent labs, and 1.0 percent for radiologist services. In general, beneficiary liability under the 75th percentile fee schedule goes down almost uniformly for all types of service. The greatest decreases are in diagnostic medical services (-6.1 percent), medical and consultation services (-3.4 percent each), and surgery (-2.7 percent).

A fee schedule based upon average allowed charges does not appear on the whole to be a tractable option. While allowed charges are greatly reduced, they probably are reduced to a degree that is too great to be acceptable. Moreover, beneficiary liability also increases substantially

in some cases. Under this option, the allowed charge reductions are quite sizable across all types of service. General practice physicians would have reductions of only 2.7 percent, but other physicians would have allowed charge reductions running from the teens to 23.1 percent. Increases in beneficiary liability, by specialty breakdown, would range as high as 16 percent (for patients of ophthalmologists and OBGs). By type of area, beneficiary liabilities would show their greatest increases in lesser metro areas, at 26.9 percent, compared to an increase of 3.9 percent in major metro areas and a decrease of 1.1 percent in rural areas. Beneficiary liability also would increase most greatly for patients of physicians with the largest number of Medicare patients and the largest proportion of their revenues derived from Medicare.

The current Pennsylvania UCR system, without indexing, would allow increases that are moderate on the whole. For general practice, family practice, and internal medicine physicians, the increase in allowed charges would be barely more than one percent. Anesthesiologists are apparently the hardest hit by indexing, with the findings indicating that their allowed charges would rise by approximately 17 percent without indexing. Indexing also appears to have some of its greatest effects upon younger (and more expensive) doctors, and upon doctors who serve relatively few Medicare patients. Beneficiary liability under indexing would be very little affected with respect to services of general practitioners, family practice physicians, and internists. The liabilities would be reduced most greatly in relation to services of opthalmologists, proctologists, anesthesiologists, and OBGs, with decreases ranging from 2.1 to 1.7 percent. The liability would be up

slightly for services of medical oncologists, podiatrists, and radiologists. This is generally reflected also in the beneficiary liability findings for types of service. Geographically, the greatest change in beneficiary liability would occur in lesser metropolitan areas, with an increase of 15.5 percent.

III. CONCLUSIONS AND RECOMMENDATIONS

The findings here suggest fairly clearly that conventional economic demand factors are of only limited consequence in the determination of physicians' prices in Pennsylvania. When looking at the entire state, demand factors are found to be small or insignificant. If Philadelphia County is excluded, so that the object of study becomes the physicians' services market everywhere in Pennsylvania other than center city Philadelphia, demand factors assume a position in relation to prices that is at least slightly more rational. To the extent that demand factors do achieve any significance, or become large enough to be noticed, they present themselves as positively related to price.

The relationship of physician supplies to prices in the market for physician services is consistently positive. This relationship presents itself in a complicated variety of ways, however, depending upon the particular specialty cohort involved, depending upon whether the geographic domain does or does not include Philadelphia, and often depending upon the specific market being examined (Blue Shield, Medicare, or aggregate). There are certain combinations of market, physician cohort, and geographic domain for which the physician supply variable is either insignificant or negligibly small.

When dealing with all physicians, the relation of physician supplies to price was positive in every case tested, but clearly was stronger with Philadelphia included. For primary care physicians, a clearly positive relationship of supplies to prices is found in the Medicare market only if Philadelphia is included; but it is found in the Blue Shield market in

all cases tested. Medical and surgical specialists' prices appear to be positively related to supplies of complementary types of physicians, with neither group showing any within-cohort relationship of physician supplies and prices. In terms of geographic domain, this effect -- where it appears at all -- is generally stronger for the overall state than when Philadelphia is excluded. Comparative patterns of supply-price relationship also differ between the Blue Shield, Medicare, and aggregate markets, but do so in manner that does not admit any easy generalizations.

One conclusion from this is that the market is clearly segmented, with the segments being defined at least along geographic lines, along specialty-oriented lines, and by differences between insurance programs. There further would appear to be substantial and important differences between some of these segments in terms of their fundamental market character and market behavior, including differences in the way prices are determined.

Another conclusion is the further confirmation that the market for physicians' services is not a classically competitive market. The principal evidence for this lies in the observed positive relationships of physician supplies with prices and, perhaps even more so, in the diversity of prices observed. The evidence from these studies would seem to suggest the presence of physician-induced demand, at least in some major segments of the market, within the general framework of a monopolistically competitive market.

Among the subjective impressions remaining from these investigations, it must be admitted that a considerable portion of the observed variation in physicians' prices clearly remains unexplained. Specialty and

geographic area of practice account for an understandably large part of the price variation that occurs. Beyond that, however, it still is less than perfectly clear why some specialties and some geographic areas exhibit different prices in the way that they do. Factors characterizing practices and practice locations at a more detailed level explain relatively little and, when they do explain, tend to explain only weakly. The general pattern of findings suggests that the market must be acknowledged as imperfect, and also suggests that the market behavior of physicians, including their price determination processes, may be only partially driven by economic considerations.

In relation to the low level of significance attached to many practice characteristics, one alternative or additional course of explanation may be found in the individual physician's personal utilities. These may sometimes be sufficiently dominant to override conventional rational economic considerations in the determination of the physician's market behavior. The marked geographic variation observed in physician's prices, together with the rather low explanatory power of locality characteristics, also suggests that something other than purely economic forces may be operating. It may be conjectured here that the behavior of physicians in their local markets may be determined to some substantial degree by social and political influences tied to the infrastructure of the profession in local market areas. This would have to do with the market impact of a system of tacit understandings and shared values within definable local professional communities.

Turning to physician participation in insured medical markets, it appears that there is at least some measure of systematic and rational

explanation for physicians' Medicare assignment decisions and behavioral responses, even if contrary in some ways to presumed theories. On the other hand, no strong or compelling rational explanation for participation or nonparticipation with Blue Shield is in evidence. Perhaps this may be because Blue Shield participation decision processes are more essentially political and psychological than rationally economic in nature.

Some very remarkable differences were observed in physicians' behavioral responses to the Blue Shield participation decision, compared to their responses to the Medicare assignment decision. The explanation of these differences may lie in the fundamental difference between an all-or-nothing commitment in the Blue Shield participation decision, and the far more free and flexible claim-by-claim option for Medicare assignment. Perhaps the claim-by-claim assignment option under Medicare produces operational and practical impacts upon physicians that are much more like those which would occur in an open competitive market than like those to be expected from a full-commitment participating market. Alternatively (or perhaps additionally), it may be conjectured that if Blue Shield participation decisions are essentially political and/or psychological, such considerations might override the normal effects of rational economic factors.

Finally, with regard to related national health policy issues, it is apparent that prices and costs need to be brought under better control. To achieve this, it should be evident from recent experience that an arbitrary price freeze is not the answer. A freeze simply puts the market even more out of balance and builds up pressures that eventually may be even more dangerous. Regulation, while unfortunately sometimes a

necessary element, is not the complete answer either. Regulation is inherently both stifling and itself expensive, and should be a solution of last resort. Nor does the answer lie in a sweeping national health service, along the lines of the British model, or a comprehensive national health insurance program of the types associated with Senator Kennedy's efforts, and broadly supported by organized labor over the years.

What is needed is genuine market reform. It is clear, however, that certain past moves designed to promote competition have failed, or worse, yielded perverse results. Increasing the supply of physicians, for instance, has only served to increase prices in many instances, as physicians apparently quite often respond to increased competitive supply in ways typified by the demand-inducement and target income hypotheses. It also must be observed that any approach designed to make the market more purely competitive through fundamental structural changes probably could be achieved only through large-scale government intervention and control that may in the end prove self-defeating.

The most constructive policy options would seem to be those that work toward restructuring certain details of the market process within the basic context of the currently existing system. In attempting to achieve better management and control of the situation, perhaps greater emphasis should be shifted to the demand side. In particular, steps should be taken to encourage more prudent consumer choices in the acquisition of health care. The consumer, for instance, must be given a significant and meaningful cost sharing responsibility. It also would help if the cost of health insurance -- both public and private -- were made less invisible.

Specific further steps may be suggested as follows:

(1) We should continue to provide for only the truly needy with public money. Those who are financially capable should be directed to the private insurance market, with less subsidization in the form of such things as tax deductions for health insurance payments. (This general framework could include some kind of publicly funded or publicly subsidized catastrophic medical insurance for those who do not have access to private major medical programs.)

(2) Observing that greater input of Medicare Part B monies to local physicians' services markets tends to be associated with higher prices in those markets, we should be very careful about our public generosity and future extensions of Medicare benefits.

(3) It may be desirable to make Medicare assignment an all-or-nothing proposition, similar to Blue Shield participation. The findings here show that Blue Shield participation is associated with lower prices, but consistent Medicare assignment acceptance is associated with higher prices. The difference may indeed be in the case-by-case option under Medicare.

(4) A further step that might be helpful in encouraging physicians to opt "in" to participation in publicly funded health insurance programs would be to bring to all of the needy under the umbrella of a single program. If the needy were presented as a single market, it would be less tractable for the physician to segment his market and participate for some of the needy without participating for all of the needy; and all of the needy might constitute a market which would be hard to ignore.

(5) Finally, more effective inducements are needed -- or regulation, if necessary -- to improve the distribution of professional medical manpower. There are too many physicians in certain specialties and in certain geographic localities (while still too few in others). The findings here and in other studies show very clearly that, in most specialty-oriented cohorts, increased physician supplies result in higher, not lower, prices.

COMPOSITE LIST OF REFERENCES

Altman, Stuart H., and Joseph Eichenholz, "Inflation in the Health Industry -- Causes and Cures." In Health: A Victim or Cause of Inflation (Michael Zubkoff, ed.). New York: PRODIST (published for Milbank Memorial Fund), 1976, pp. 7-30.

American College of Surgeons (ACS), Surgery in the U.S., A Summary Report of the Study on Surgical Services for the United States, 1975.

Auster, Richard, and R. Oaxaca, "Identification of Supplier Induced Demand in the Health Care Sector," The Journal of Human Resources, Vol. XVI, No. 3, Summer 1981, pp. 327-342.

Bureau of Health Manpower, The Target Income Hypothesis (Jesse Hixson, ed.). U. S. Department of Health, Education, and Welfare; Health Resurces Administration, Publication No. (HRA) 80-27, 1980.

Burney, Ira L., George J. Schieber, Martha O. Blaxall, and Jon R. Gabel, "Geographic Variation in Physicians' Fees," Journal of the American Medical Association, Vol. 240, No. 13, September 22, 1978, pp. 1368-1371.

Business Week, "Rx: Competition," No. 2726, February 8, 1982, pp. 58- 64.

Coterill, Philip G., "Relative Changes in Physicians' Fees: Evidence From the Consumer Price Index," in Profile of Medical Practice, 1978 (J. Gaffney, ed.). Monroe, Wisconsin: American Medical Association, 1979, pp. 55-70.

Davis, Karen and Roger Reynolds, "The Impact of Medicare and Medicaid on Access to Medical Care," in Richard N. Rosseh (ed.) The Role of Health Insurance in the Health Services Sector, New York: National Bureau of Economic Research, 1976, pp. 391-435.

Dyckman, Zachary Y., A Study of Physicians' Fees. Staff Report prepared by the Council on Wage and Price Stability, Executive Office of the President. Washington, D.C.: U.S. Government Printing Office, March 1978.

Eisenberg, Barry S., "Medical Practice Expenses: Trends, Determinants and Impact." In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Hospital Association, 1978, pp. 37-60.

Evans, Robert G., "Supplier-Induced Demand: Some Empirical Evidence and Implications." In The Economics of Health and Medical Care (Mark Perlman, ed.). New York: Halsted Press, 1974.

Evans, Robert G. "Beyond the Medical Market Place: Expenditure, Utilization, and Pricing of Insured Health Care in Canada," in The Role of Health Insurance in the Health Services Sector (Resett, ed.) New York, National Bureau of Economic Research, 1976, pp. 437492.

Feldman, Roger, "Price and Quality Differences in the Physicians' Services Market," Southern Economic Journal, 45:885-91, January, 1979.

Feldman, Roger and James Begun," The Journal of Human Resources, XIII (Supplement): 247-262, 1978.

Feldstein, Martin S., "The Rising Price of Physicians' Services," The Review of Economics and Statistics, Vol. LII, No. 2, May 1970, pp. 121-133.

Ferry, Thomas P., et al. "Physician Charges Under Medicare: Assignment Rates and Beneficiary Liability," Health Care Financing Review, 1:49-73, Winter, 1980.

Fox, Daniel M., "From Reform to Relativism: A History of Economists and Health Care," Milbank Memorial Fund Quarterly/Health and Society, Vol. 57, No. 3, Summer 1979, pp. 297-336.

Freeland, Mark, and Carol Ellen Schendler, "National Health Expenditures: Short-Term Outlook and Long-Term Projections," Health Care Financing Review, Vol. 2, No. 3, Winter 1981, pp. 97-138.

Fuchs, Victor R., "The Supply of Surgeons and the Demand for Operations," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 35-36.

Fuchs, Victor R., and Marcia J. Kramer, Determinants of Expenditures for Physicians' Services in the United States 1948-68. National Center for Health Services Research and Development; DHEW Publication No. (HSM) 73-3013, December 1972.

Fuchs, Victor R. and Joseph Newhouse, "The Conference and Unresolved Problems," Journal of Human Resources, Vol. XIII, Supplement, 1978, pp. 5-20.

Gabel, Jon, "Analysis of Third Party Payment Levels: Technical Appendix, Chapter 5, Cost-of-Living Adjustment," in Institute of Medicine, Social Security Studies: Final Report, Part IV, Medicare-Medicaid Reimbursement Policies, July, 1976.

Gibson, Robert M., and Daniel R. Waldo, "National Health Expenditures, 1980," Health Care Financing Review, Vol. 3, No. 1, September 1981, pp. 1-54.

Goldfarb, Marsha G., Mark C. Hornbrook, Joyce V. Kelly, and Alan C. Monheit, "Health Care Expenditures." In Health United States 1980, U. S. Department of Health and Human Services, Office of Health Research, Statistics, and Technology. DHHS Publication No. (PHS) 81-1232, December 1980, pp. 101-116.

Green, Jerry, "Physician-Induced Demand for Medical Care," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 21-34.

Grittelsohn, Alan and John Wennberg, "On the Incidence of Tonsillectomy and Other Common Surgical Procedures," in John Bunker et al. (eds.), Costs, Risks, and Benefits of Surgery, (New York: Oxford University Press, 1977), pp. 91-106.

Hadley, Jack, John Holahan, and William Scanlon, "Can Fee-for-Service Reimbursement Coexist With Demand Creation?" Inquiry, Vol. XVI, No. 3, Fall 1979, pp. 247-258.

Hadley, Jack, and Robert Lee, Physician Price and Output Decisions: Theory and Evidence, Urban Institute, Working Paper 988-8, Washington, D. C. , April 1978.

Health Care Financing Administration (HCFA), "Determination of Reasonable Charges Under Part B of Medicare - A Basic Text," Washington, D. C.: GPO, September, 1977.

Health Resources Administration (HRA), The Current and Future Supply of Physicians and Physician Specialists, DHHS/HRA/Pub. No. (HRA) 80-60, 1980.

Held, Philip, and L. Manheim, "The Effect of Local Physician Supply on the Treatment of Hypertension in Quebec." In The Target Income Hypothesis, (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 44-59.

Hirshleifer, Jack, Price Theory and Applications, Second Ed., Englewood Cliffs: Prentice-Hall, 1980.

Holahan, John, and William Scanlon, Physician Pricing in California: Price Controls, Physicians' Fees, and Physicians' Incomes from Medicare and Medicaid. U.S. DHEW, under contract with the Urban Institute; DHEW Publication No. (HCFA) 03006, September 1979.

House, Donald R., "Conflicting Theories of the Determination of the Entrepreneur's Income: An Analysis of the Practicing Dentist." In The Target Income Hypothesis (Jesse Hixon, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 83-92.

Huang, Lien-Fu and Orest Koropecky. The Effects of the Medicare Method of Reimbursement on Physicians' Fees and Beneficiaries Utilization. Volume II, Part I. Washington, D.C.: Robert R. Nathan Associates, April, 1973.

Jensen, Lynn E., "Trends in Health Care Costs and Prices". In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Medical Association, 1978, pp. 1-26.

Juba, David A., Price Setting in the Market for Physicians' Services: A Review of the Literature. Camp Hill, Pennsylvania: Pennsylvania Blue Shield, Research Report R-79-1, January 1978. (Also released as DHEW Publication No. (HCFA) 03012, September 1979.)

Lee, Robert H., and Jack Hadley, "Physicians' Fees and Public Medical Care Programs," Health Services Research, Vol. 16, No. 2, Summer 1981, pp. 185-203.

Markel, Gene A., and Laverne J. Dudley, Patterns of Pricing Behavior in the Pennsylvania Physician Services Market. Camp Hill, Pennsylvania: Pennsylvania Blue Shield, Research Report R-419-14, November 1981.

May, J. Joel, "Factors Influencing the 'Demand' for Health Care." In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Medical Association, 1978, pp. 117-122.

McLean, Robert A., "The Structure of the Market for Physicians' Services," Health Systems Research, Vol. 15, No. 3, Fall 1980.

Mitchell, Janet B., and Jerry Cromwell, Physician Induced Demand for Surgical Operations. Final Report submitted under HCFA Grant 95-P-97245/2-01, December 1980.

Mitchell, Janet B., and Jerry Cromwell, Physician Behavior Under the Medicare Assignment Option. Final Report submitted under HCFA Contract No. 500-78-0051, January 1981.

Mitchell, Janet B., Jerry Cromwell, and Rachel Schurman, Physician Participation in Public Programs. Chestnut Hill, Mass.: Center for Health Economics Research, September 1981.

National Center for Health Statistics, Surgical Operations in Short-stay Hospitals, United States, 1968, Vital and Health Statistics, Series 13, No. 11, January, 1973, 1977 (unpublished).

Newhouse, Joseph P., "A Model of Physician Pricing," Southern Economic Journal, Vol. XXXVII, No. 2, October 1970, pp. 174-183.

Newhouse, Joseph P., "The Structure of Health Insurance and the Erosion of Competition in the Medical Marketplace." In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 215-229.

Newhouse, Joseph P., and Charles E. Phelps, "Price and Income Elasticities for Medical Care Services." In The Economics of Health and Medical Care (Mark Perlman, ed.). New York: Halsted Press, 1974.

Paringer, Lynn, "The Medicare Assignment Rates of Physicians: Their Responses to Changes in Reimbursement Policy," Health Care Financing Review, Vol. 1, No. 3, Winter 1980, pp. 75-89.

Pauly, Mark V., "Is Medical Care Different?" In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 11-35.

Pauly, Mark V., Doctors and Their Workshops: Economic Models of Physician Behavior. Chicago: University of Chicago Press, 1980.

Pauly, Mark V., "Hospital Characteristics, Physician Productivity, and Fee Levels." In Issues in Physician Reimbursement (Nancy Thorndike Greenspan, ed.); Health Care Financing Conference Proceedings. HCFA Publication No. 03121, August 1981, pp. 31-74.

Pauly, Mark V., and Mark A. Satterthwaite, "The Effect of Provider Supply on Price." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/HMA, Publication No. (HRA) 80-27, 1980, pp. 26-36.

Pauly, Mark V., and Mark A. Satterthwaite, "The Pricing of Primary Care Physicians' Services: A Test of the Role of Consumer Information," Bell Journal of Economics, Vol. 12, No. 2, Autumn 1981, pp. 488-506.

Pennsylvania Blue Shield, PBS Charge/Allowance Indexes for 3rd Quarter, 1981. Research Division, Quarterly Index Report #28, November 1981 (Proprietary).

Pennsylvania Blue Shield, 1981 PBS Doctor Survey, Camp Hill, Pennsylvania: Research Division, July, 1981.

Ramsey, James B., "An Analysis of Competing Hypotheses of the Demand for and Supply of Physician Services." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 3-20.

Redisch, Michael, Jon Gabel, and Martha Blaxall, Physician Pricing, Costs and Incomes. Paper prepared for Western Economic Association meetings, Anaheim, California; June 20, 1977.

Reinhardt, Uwe E., "A Production Function for Physicians Services," The Review of Economics and Statistics, Vol. 54, February 1972, pp. 55-56.

Reinhardt, Uwe E., "Comment" (on Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 121-148.

Roehrig, Charles S., "A Formal Model of Target Income Pricing with Supplier-Induced Demand." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW//HRA/DMA, Publication No. (HRA) 80-27. 1980, pp. 21-25.

Rushefsky, Mark E., "A Critique of Market Reform in Health Care: The 'Consumer-Choice Health Plan'," Journal of Health Politics, Policy and Law, Vol. 5, No. 4, Winter 1981, pp. 720-741.

Saving, Thomas R., "Discussion," in The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 99-100.

Sloan, Frank, "Physicians and Medicaid," Analysis of Survey Data on Physician Practice Costs and Income. Final Report submitted to HCFA, DHEW under Conract No. 500-78-0018, September, 1979, pp. 21-28.

Sloan, Frank, "Discussion," in The Target Income Hypothesis (Jesse Hixon, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 93-95.

Sloan, Frank, Effects of Health Insurance on Physicians' Fees. Paper presented at the Southern Economic Association meetings, Washington, D.C.; October 1980.

Sloan, Frank, "Physicians Fees and Length of Visit," Chapter 3 in An Analysis of Survey Data on Physician Practice Costs and Incomes. Final Report, HCFA Contract No. 500-78-0018, April 1981.

Sloan, Frank et al., An Analysis of Determination of Health Care Utilization: Preliminary Report for Area 2: Market Conditions and Provider Response, DHEW/HRA/BHM, January, 1980.

Sloan, Frank, Jerry Cromwell, and Janet Mitchell, "Physician Participation in State Medicaid Programs," Journal of Human Resources, Vol. 13: 211-45, Supplement, 1978.

Sloan, Frank, and Roger Feldman, "Competition Among Physicians." In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 45-102.

Sloan, Frank, and Roger Feldman, "Monopolistic Elements in the Market for Physicians' Services," in W. Greenberg (ed.) Competition in the Health Care Sector: Past, Present and Future, Proceedings of a conference sponsored by the Federal Trade Commission, March, 1978, pp. 57-131.

Sloan, Frank and John Lorant, "The Allocation of Physicians' Services: Evidence on Length of Visit," Quarterly Review of Economics and Business 16, Autumn 1976: 85-103.

Sloan, Frank, and John Lorant, "The Role of Waiting Time: Evidence from Physicians' Practices," The Journal of Business of the Unviersity of Chicago, Vol. 50, No. 4, October, 1977, pp. 486-507.

Sloan, Frank and Bruce Steinwald, "Physician Participation in Health Insurance Plans: Evidence on Blue Shield," The Journal of Human Resources, XIII: 237-263, 1978.

Sloan, Frank, Wisniewski, and Guterman, An Analysis of Determinants of Health Care Utilization, preliminary report under HEW Contract No. HRA 232-78-0138, January, 1980.

Stano, Miron, The Pricing and Utilization of Physicians' Services, paper presented at Eastern Economic Association meetings in Washington, D. C., April 1978, pp. 1-19.

Steinwald, Bruce, and Frank A. Sloan, "Determinants of Physicians' Fees," Journal of Business, Vol. 47, October 1974, pp. 493-511.

Sweeney, George, "Determinants of Physicians' Earnings: An Empirical Test of the Target Income Model," Appendix E to Final Report under HCFA Contract No. 500-78-0018, September, 1979.

Theodore, Chris N., and Judith S. Warner, "Physicians' Fees and the Source or Their Increase." In Health: A Victim or Cause of Inflation (Michael Zubkoff, ed.). New York: PRODIST (published for Milbank Memorial Fund), 1976, pp. 149-163.

Vahovich, Steven G., "Physicians' Supply Decisions by Specialty; 2565 Model," Industrial Relations, Vol. 16, No. 1, February 1977, pp. 51-60.

Wennberg, John, and Alan Gittelsohn, "Small Area Variations in Health Care Delivery," Science, Vol. 182, December 1973, pp. 1102-1108.

Wildavsky, Aaron, "Doing Better and Feeling Worse: The Political Pathology of Health Policy." In Doing Better and Feeling Worse: Health in the United States (John H. Knowles, ed.). New York: W. W. Norton & Company, 1977, pp. 108-109.

Yett, Donald E., Wiliam Der, Richard L. Ernst and Joel W. Hay, "Blue Shield Plan Physician Participation," Health Care Financing Review, 2:9-24, Spring, 1981.

Yett, Donald E., William Der, Richard L. Ernst, and Joel W. Hay, A Model of Physician Pricing, Output, and Health Insurance Reimbursement: Findings from a Study of Two Blue Shield Plans' Claims Data. Working paper (HCFA Contract No. 600-76-0160), 1980.

Yett, Donald E., "Comment" (on Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp.103-120.

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part Two:

Descriptive Findings

on Physician Price Variation

By: Gene A. Markel
Laverne J. Dudley

I. INTRODUCTION

This part (Part Two) of the project Final Report presents detailed findings from the descriptive phase of study on pricing practices in the market for physicians' services in Pennsylvania. Overall, the project seeks to develop improved knowledge and insight into the pricing behaviors of physicians, including an exploration of the relationship of physicians' fees to individual physician characteristics and to characteristics of their practices and practice locales. The studies emphasize use of source data from files of claims paid by Pennsylvania Blue Shield (PBS) both as a Medicare Part B carrier and as a major provider of private health insurance throughout the state of Pennsylvania.

A. SCOPE AND OBJECTIVES

The primary purpose of the work performed in this phase of the project was to detect, describe, and summarize patterns of variation observed in Pennsylvania physicians' fees. The descriptive results reported here provided early insights into the nature and variety of physicians' pricing practices in Pennsylvania and suggested a number of generalizations, conjectures, and ideas for further study in subsequent analytic phases of the project.

Methodologically, the primary emphasis here is upon measures of central tendency and dispersion in the distributions of physicians' fees for selected specific procedures and services performed by physicians. Starting with data developed at the level of the individual physician,

empirical patterns of pricing behavior are explored for: (a) the overall physician population in the state; (b) cohorts of physicians organized according to broad specialty classes; and (c) cohorts of physicians organized by geographic areas which might be viewed as loose approximations of macro-scale market areas within the state.

The question of price discrimination by physicians is of particular interest. At the individual physician level, this aspect of the investigation very simply seeks to determine whether there is demonstrable evidence that individual physicians charge different prices to different patients, or to different classes of patients, for the same services. At the population (or cohort) level, it seeks to detect evidence of the extent to which there are characteristic price differences between physicians, or between groups of physicians, for essentially the same services. These questions are addressed in a general and inferential sense through interpretation of statistical measures of dispersion in the fee data distributions.

The objectives of this descriptive phase of the project may be summarized as follows:

(1) To determine and display characteristic relative price levels for each of several selected representative procedures performed by physicians;

(2) To detect evidence of possible price discrimination for specific procedures at the individual physician level;

(3) To obtain some measure of the relative homogeneity or disparity between different physicians in their

characteristic pricing practices for essentially the same services;

(4) To obtain quantitative measures of differences in prices charged to Medicare beneficiaries and to Blue Shield subscribers for (nominally) the same services;

(5) To examine within-group and between-group variations in pricing practices by broad specialty groups, for selected specific procedures;

(6) To examine differences (or similarities) in physicians' pricing practices by geographic area.

B. SUMMARY OF FINDINGS

In general, the results of this phase of study revealed substantial variation in fees charged for most procedures. The variation is in some ways systematic, and in some ways appears almost to be haphazard. The findings reflect the already well known fact that specialists charge more for their services than generalists. The extent of the specialist fee differential varies, however, for different kinds of services. Moreover, although there always is at least one specialty group having higher average fees than generalists for any given procedure, the generalist group is not always the absolutely lowest in fee. There are some procedures for which the generalist group ranks in the middle.

There is clear evidence of differences in price between the Medicare and Blue Shield programs. The differences frequently are very slight and are not entirely consistent, however. Medicare tends to get slightly

lower prices for diagnostic medical and pathology services; but the results are mixed for other types of services, with Medicare prices sometimes higher and sometimes lower than those for Blue Shield.

For most procedures, there is scant evidence of significant price discrimination at the individual physician level, particularly in the Blue Shield program. On the other hand, the summary statistics for many of the procedures reflect somewhat greater dispersion of fees at the individual physician level in the Medicare data than in the Blue Shield data. These results suggest that while there is relatively little discrimination in either program at this level, there is a slightly greater tendency toward at least a modest amount of price discrimination with Medicare beneficiaries than with Blue Shield patients.

As may be expected, there is fairly extensive fee variation between physicians; but for most procedures this variation does not appear to be excessively great. Agreement between physicians on fee levels appears to be relatively higher for anesthesia services, for most definitive surgical procedures, and for some radiology. The least agreement is exhibited for hospital visits, for diagnostic surgical procedures commonly performed in the office setting, and for some pathology services. As would be expected, the level of agreement for many, but not all, procedures is higher when controlling for specialty group.

Also as expected, prices for physicians' services tend to be highest in the Philadelphia urban area. Contrary to expectation, however, prices in the Pittsburgh urbanized area tend on the whole to be relatively moderate. Rural areas are not always the lowest in price.

C. OUTLINE OF REPORT

Detailed findings are reported in several extensive tables and accompanying narrative in Sections IV through VII of this part of the Final Report. Section IV presents aggregate results for the statewide sample of all physicians included in the study. Sections V and VI examine findings within and between specialty groups, respectively. Section VII presents results by geographic area. First, however, Section II describes and discusses the study data base; and Section III presents a general discussion of the statistical measures used in relation to study objectives.

More analytically oriented work concerning prices and pricing behavior in the market for physicians' services is reported in Parts Three and Five of this Final Report series. Work reported in these other parts of the Final Report characterize the individual physician's aggregate pricing level through a single-valued cross-sectional price relative, and use analysis of variance and econometric approaches to examine empirically observed pricing behavior in relation to possible explanatory factors.

II. DATA BASE

Data used for this study were derived principally from computer files created as a by-product of PBS claims administration for the Medicare Part B and private Blue Shield programs in Pennsylvania. In the course of day-to-day claims processing and payment, a number of data items for each claim are captured and retained in claims transaction history files. For each claim transaction, these file records identify the doctor, the patient, the exact service performed, the date of service, amount billed, amount allowed for payment, date of payment, and other related items incidental to the handling of the claim. Separate claims experience files are created and maintained for Medicare Part B and for Blue Shield private business.

A. GENERAL DESCRIPTION OF STUDY DATA BASE

This study focuses upon forty-four specific commonly performed physician procedures. Specific procedures were selected against criteria to assure that they would be generally well known (i.e., familiar to most people), unambiguously defined, and occuring with sufficient frequency to assure statistically adequate sample sizes. In addition, the topic procedures were selected to provide a reasonably representative cross-sectional mix of the various types of services performed by physicians. Complete terminologies for each of the selected procedures are listed below, organized by major generic type of service:

General Medical Services and Visits --

- o Brief office visit
- o Intermediate office visit
- o Intermediate home visit
- o Initial hospital visit with comprehensive history and physical examination
- o Brief hospital visit
- o Intermediate hospital visit
- o Comprehensive consultation

Surgical Procedures --

- o Excision of breast cyst, unilateral
- o Arthrocentesis, major joint
- o Colles fracture, closed manipulative reduction
- o Tonsillectomy, child
- o Tonsillectomy, adult
- o Appendectomy
- o Proctosigmoidoscopy
- o Cholecystectomy
- o Herniorrhaphy, inguinal, unilateral
- o Transurethral resection (TUR) of prostate
- o Dilation and curettage (D&C)
- o Hysterectomy, total, abdominal
- o Laminotomy for herniated intervertebral disc, unilateral, lumbar
- o Excision, lens, unilateral, for cateract, etc.

Obstetrics --

- o Obstetrical delivery, vaginal, including antepartum and postpartum care

Anesthesia Services --

- o for excision of breast cyst
- o for tonsillectomy, child
- o for tonsillectomy, adult
- o for appendectomy
- o for cholecystectomy
- o for herniorrhaphy
- o for TUR prostate
- o for D&C
- o for hysterectomy
- o for laminotomy
- o for excision of lens

Diagnostic Radiology --

- o X-ray, chest, PA and lateral
- o X-ray, knee, 3 or 4 views
- o Upper gastrointestinal (UGI) study
- o Colon, single procedure, routine barium enema
- o Cholecystography

Diagnostic Medical Services --

- o Electrocardiogram (EKG) with interpretation and report
- o Electroencephalogram (EEG)

Pathology --

- o Urinalysis
- o Cholesterol blood
- o Fasting blood sugar (FBS)
- o Complete blood count (CBC)

Claims records for services indicating any of the above procedures were selected from the PBS paid claims history files for calendar year 1975 for both Medicare Part B and private Blue Shield. Further, to assure at least a minimal degree of statistical validity, claims experience for any one of the selected procedures was taken only for physicians who reported (claimed) at least ten services for the given procedure during the year. Thus the basic structure of the study data base reflects specific individual physician-procedure pairs. Each record in the basic file represents a unit transaction between an individual physician and patient, involving delivery of a specified procedure from among the forty-four topic procedures, for an indicated price. Information also was added to the file to indicate each individual physician's specialty and location of practice (county). In addition, summary records were created showing for each physician-procedure pair the mean, median, mode, maximum, standard deviation, skewness, kurtosis, and coefficient of variation of

the given physician's distribution of billed charges for the given procedure.

The abstracted claims experience file selected and developed in this manner contained pricing and related data on 11,322 individual physicians, with 10,347 represented in the Medicare component of the data base and 8,037 represented in the Blue Shield component. The excluded physicians are by definition low volume providers (in the lines of business covered by PBS), and very little was lost by their exclusion.

Although the data base contains information on only forty-four procedures out of approximately 5,000 listed in the overall PBS procedure terminology system, the selected procedures tend to be high volume procedures. The great majority of the approximately 5,000 procedures in the PBS terminology system are rarely, if ever, reported. Consequently, the selected procedures, although relatively very small in number, still represent nearly 40 percent of all services for all procedures in PBS private Blue Shield business, and more than half of all services for all procedures reported to PBS under Medicare Part B in 1975. In total, the data base developed for this study contains close to six million individual transaction records.

Finally, it should be noted that anesthesia procedures are represented in the data base in two different ways. They are represented first on an "episode" basis, in which the base unit for all statistical calculations is a single complete visit to the operating room involving application of anesthesia. Anesthesia services, however, are billed and reimbursed on a relative value unit basis. In this system, the billing and reimbursement are determined by a base value which depends upon the

specific surgical procedure for which anesthesia is being applied, plus additional value units representing time spent in the operating room and potentially complicating circumstances, such as age or debilitated physical condition of the patient. Since the episode basis for calculating price statistics may largely be reflecting differences in time and clinical circumstances from case to case, the price statistics and statistical characteristics for anesthesia services also are calculated on a "unit of service" basis. The service unit basis should more accurately represent real differences in pricing from physician to physician.

B. DATA QUALITY CONTROL

Claims data bases characteristically contain spurious and invalid data in sufficient quantities to induce undesirable and unpredictable inaccuracies in the calculation of parametric statistics (e.g., population means and measures of dispersion) for distributions of price data represented in the files. In a project of this nature, on the other hand, where the primary emphasis is upon descriptive statistics for price data distributions, it clearly is important that the price data in the basic source reference files be valid and correct to the greatest extent possible. Stringent data quality control procedures were employed in an effort to minimize and, to the extent possible, eliminate data quality problems from the final project data base.

The first stage of this effort was an assessment of potential data quality problems in the basic source files to be used for the study. To accomplish this, claims records associated with the tails of the price

data distributions were identified and isolated, on the assumption that this is where the greatest proportion of incorrect or questionable data would be found. Certainly, at least, this is where spurious and invalid data do the most harm. This investigation entailed segregating and developing detailed computer-generated listings of claim transaction records indicating unusually high or unusually low physician fees for the service indicated. Examination of a sample of original hard copy claims associated with these records revealed a significant number of claims records in the computer system that incorrectly represented their source transactions. Specific problems encountered included miscoded information (e.g., wrong procedure code), data entry errors (e.g., transpositions, or data entered in the wrong character fields), inclusion of records with action codes indicating some irregularity in the handling and/or disposition of the original claim, supplemental payments related to an earlier claim appearing as a new claim, and others.

Further research then was conducted to identify and develop appropriate data edits and screens that could be applied by computer in order to efficiently and expeditiously assure a satisfactory degree of data quality control. These analyses included consideration of possible variations in definitional content for each procedure, characteristics and conditions of clinical usage, associated price data distributions and characteristics, and applicable guidelines and practices employed in claims administration. The resulting edit routines removed anomalous data arising from errors in coding and data entry by screening out records for claims with places of treatment, physician specialty codes, service quantities, or billed charge levels that would be inconsistent with the

specific procedure indicated. In addition, records including action codes entered in conjunction with the claims processing and payment operation were screened out of the data base. Action codes are used in claims processing to identify atypical claims -- for which it may be reasonable to assume that the pricing indicated on the claim record also could be atypical.

In the application of these edit routines, 123,249 services were screened out of the initial data base of private Blue Shield claims experience, and 335,031 services were screened out of the initial Medicare claims experience base extracted from these studies. The deleted volumes represent 7.3 percent of the services in the initially extracted Blue Shield base, and 5.9 percent of the initially extracted Medicare base.

The data screens and edit routines evidently were effective in accomplishing their objectives. Extremely high and extremely low values disappeared from the physician price data distributions. A random sampling of the eliminated records and services confirmed that they were almost uniformly faulty and invalid.

In sum, it can be concluded that overall data base quality was greatly improved by the application of these data screens and edits. The remaining post-edit data base can be accepted as consisting of predominately good and valid data. It also can be reasonably assumed that very little good data was lost while purging the bad data.

C. DATA STRATIFICATIONS

Physician price data for this study were stratified in three different ways: (1) by program (Blue Shield or Medicare); (2) by physician specialty group; and (3) by geographic area of practice location.

The stratification into Blue Shield and Medicare components followed naturally from the independent development and maintenance of two separate, but parallel, data base components for the two programs.

It is generally perceived and understood that specialty status is one of the factors influencing a physician's pricing decisions, while also influencing patients' decisions on the prices they are willing to pay or expect to pay. For this reason, it is important to be able to control for specialty in an investigation of physicians' prices. The 11,322 physicians represented in the study base are in 29 different specialties. For several practical reasons -- including convenience, efficiency and economy in computation and analysis, and ease of communicating findings -- these are consolidated into five broad categories for purposes of this investigation. The five broad specialty groups defined for this study are: (1) generalists, consisting of general practice and family practice physicians; (2) medical specialists; (3) surgical specialists; (4) anesthesiologists; and (5) physicians in other specialities, such as radiology, pathology, and psychiatry.

It also is generally observed and accepted that physicians' prices may vary from place to place geographically. The popular perception is that prices are highest in the major cities, lowest in rural areas, and

somewhere in between for lesser urbanized areas. To take the locality factor into account, the data base is geographically stratified to reflect Standard Metropolitan Statistical Areas (SMSAs) in Pennsylvania, with the further assumption that these may at least loosely represent distinct macro-market areas within the state. Twenty-seven of Pennsylvania's 67 counties are associated with SMSAs. With Philadelphia partitioned into a center city component and a suburban component, and aggregating all non-SMSA counties as a single group, there are a total of fifteen areas represented in this stratification.

III. MEASURES OF PRICING BEHAVIOR

Clear definition of the questions and issues being addressed always must precede measurement. The measurement itself then must be done in a manner that has a satisfactory degree of statistical validity and legitimacy, and further, must produce measures that have clear and reasonable meaning in relation to the original questions. In addition, measurement must be realizable in operationally practical terms, which sometimes dictates some compromise between reality and the ideal. The perfectly defined measure will be of no practical value, for instance, if it requires data which are not attainable, or if the associated computational demands are excessive.

For the first of these considerations, the key questions addressed in the present study may be outlined as follows:

(1) At the individual physician level --

(a) What is each physician's usual price for each procedure for which he is represented in the data base? This is to be a single value indicating the physician's typical or most representative price level for the procedure.

(b) For each physician-procedure pair represented in the data base, does the physician appear to exhibit some consistency in the price he charges for the procedure; or does his price appear to have a relatively high degree of variability, possibly exhibiting some price discrimination from case to case?

(c) To the extent that there is variability in the fees charged by an individual physician, are his most typical fees concentrated on the high side of his fee distribution, with occasional exceptions being billed at a lesser fee level; or is his most typical charge on the low side of the distribution, with exception cases being billed at a higher level?

(2) At the physician population (cohort) level --

(a) For each topic procedure, what is the single price level that may be taken as most representative for all of the individual physicians in the group?

(b) For each procedure, relatively how consistent do the individual physicians in the group appear to be in their respective pricing practices? Do the individual physicians comprising the group most typically appear to exhibit some possible discriminatory behavior in their individual pricing practices; or do they most typically appear to have relatively consistent prices?

(c) For each procedure, how well do physicians in the group agree with one another on typical pricing levels? Are the typical, most representative prices for individual physicians in the group fairly close to one another; or are the individual physicians' typical and most representative prices scattered relatively widely?

(d) To the extent that different physicians exhibit different characteristic prices for the same procedure, do most of the physicians appear on the high side, or on the low side, of the range of characteristic fees?

The intent of this study is to place primary emphasis on the pricing behavior of individual physicians as individuals. As one of the necessary compromises with practical reality, however, it readily should be appreciated that the only way to draw generalizations about the individual pricing behaviors of 11,322 different physicians is in terms of summary statistical measures. It is possible, however, to employ conventional population statistics in such a manner as to place relatively greater emphasis either on individual physician characteristics or on collective characteristics of the overall population. The statistical measures described below, although developed at a population (or cohort) level, tend to emphasize representative individual physician characteristics.

A. PRICING CHARACTERISTICS FOR INDIVIDUAL PHYSICIANS

The first step in this study was to develop sets of statistics to describe characteristic pricing behavior for each individual physician, by specific procedure. This required, at the very least, an appropriate measure of central tendency to characterize the physician's "most representative" price, plus a measure of dispersion to serve as a suitable indicator of the relative consistency or variability in his pricing behavior.

1. Central Tendency

A physician's characteristic price for a given procedure should be expressed in terms of a single value indicating the fee level reflected in most of his billings -- i.e., that fee level which can be presumed to be most representative of the value which the physician places on the given service in most of the instances he provides it, even though he may occasionally have a different fee level under certain (presumably special or unusual) circumstances. Statistically this requires a measure of central tendency, which conventionally could be either the mean, median, or mode of the physician's distribution of billed charges (fees) for a given procedure. All three were, in fact, calculated; but for purposes of this study, the median was selected as the most convenient and appropriate measure of central tendency. The mean was felt to be unsuitable because of its sensitivity to extreme values, particularly in cases where there are relatively few observations. Moreover, the mean -- by the very way in which it is defined and determined -- could give a specific value that does not in fact exist anywhere in the distribution. The mode perhaps would have been the most theoretically correct statistic for the purpose intended (i.e., most commonly occuring value). However, the mode also is computationally and interpretively more difficult to deal with, particularly in view of the fact that some of the physicians' fee distributions exhibited more than a single mode. The median very frequently turned out to be identical to the mode, in any event.

2. Fee Dispersion

The degree of dispersion in an individual physician's distribution of fees for a given procedure was captured by calculating the standard deviation of the distribution about the mean. To facilitate a more meaningful interpretation of these dispersion statistics, the standard deviations were converted to coefficients of variation. The coefficient of variation (CV) for a data distribution is simply the standard deviation divided by the mean. The net effect of converting a standard deviation to a CV is that it standardizes the measure of dispersion to account for, and essentially removes the effect of, the relative scale factor arising from the general magnitude of the values represented in the distribution. As an example to better illustrate the general difficulty which this resolves, we may note that we would not have gained very much simply by knowing that the standard deviation of a given fee distribution is $5.00. This same standard deviation figure would have totally different significance and meaning relative to a distribution of office visit fees tending to be in the neighborhood of ten dollars than it would have in relation to a distribution of fees for a surgical procedure with a typical price in the neighborhood of one hundred dollars. For the office visit, the $5.00 standard deviation would convert to a coefficient of variation of .500 indicating that the standard deviation is fifty percent of the mean value; but for the surgical procedure, it would convert to a coefficient of variation of .050, indicating a standard deviation that is only five percent of the mean value, and therefore of much less consequence.

The practical interpretive value of the CV in this instance is that it serves as a very useful indicator of the extent to which the physician is consistent in his pricing practices. A small CV indicates relatively uniform and consistent pricing; a relatively larger CV indicates that the physician has different prices at different times, or in different circumstances, for the same procedure. Interpretation of CVs is an essentially subjective matter, in the sense that the precise meaning of a given specific CV value usually is somewhat less than perfectly clear. Nevertheless, it remains true that a very small CV characterizes a doctor who engages in little or no price discrimination; and the larger the CV the greater the likelihood that the physician may be discriminating in his pricing practices.

The CV statistic has a minimum value of zero and is unbounded on the high side.

3. Skewness

The skewness of a data distribution is a statistical measure indicating the direction and extent of the distribution's deviation from symmetry. A skewness of zero indicates a distribution that is essentially symmetric, with exceptions on the high side of the mean and exceptions on the low side of the mean being more-or-less balanced. A positive skewness indicates that most of the cases are concentrated in the lower part of the range of values represented in the distribution, with a relatively smaller number of exception cases tailing off to the higher valued end of the range. Conversely, a negative skewness indicates that most of the cases are on the high side of the range of values represented, with a relatively

smaller number of exception cases tailing off to the low end of the range. The magnitude of the skewness, whether positive or negative, indicates how extreme is the departure from symmetry. The larger the value of the skewness, the more extreme the exception cases -- i.e., in a graphic representation, the longer the tail of the distribution to the side away from the main concentration.

For present purposes, the skewness statistic should -- at least in principle -- tell us whether the physician tends usually to have a relatively lower fee, with the occasional exception cases being charged a somewhat higher fee, or vice versa. It also should provide some information as to how greatly the exception cases deviate from his usual fee. As a matter of practical fact, however, this statistic is quite hard to interpret at the individual physician level. In the first place, the sample sizes are relatively small for many of the individual physician-procedure pairs. Second, the fee distributions at the individual physician level are not necessarily even approximately normal; some are bimodal or multimodal. For both of these reasons, it seldom is really clear exactly what kind of distribution we are looking at in connection with any given individual physician's skewness measure. The skewness value cannot necessarily be assured to mean the same thing it would mean if one could confidently assume that the individual physician fee data distributions were reasonably normal. Further, while measures of central tendency and dispersion may have some degree of validity and practical meaning for relatively small samples (say, as small as ten observations), adequately large sample sizes become increasingly important in the calculation of higher order moments. In addition, this statistic

in the present application may be influenced -- in ways that are not necessarily readily determinable -- by the timing of an individual physician's price changes. Assuming, for example, a price increase late in the year, this would create a relatively small number of observations significantly above the overall mean of the annual distribution. This situation would exhibit as a positive skew, ceteris paribus; but, without prior knowledge of the price change, it would not necessarily be interpreted for what it really reflects.

Skewness measures were calculated in this study for fee distributions at the individual physician level; but, because of the interpretive difficulties cited above, they are not presented or interpreted in this report.

B. PRICING CHARACTERISTICS FOR GROUPS OF PHYSICIANS

In an examination of the pricing behavior of physicians, it is for some purposes important to concentrate upon individual physician behavior, and for other purposes important to concentrate upon the collective behavior of physicians. In either case, for reasons discussed above, appropriate measures must be developed at the physician population level. The population measures developed and calculated for purposes of this study are described and discussed below.

1. Characteristic Price Levels

Whether dealing with individual physician behavior or with the collective behavior of all (or a cohort of) physicians, characteristic

price levels must be expressed in terms of a statistical measure of central tendency. It already has been pointed out that each individual physician's characteristic price (for a given procedure) is represented in this study by the median of his fee distribution, as determined from the billed charges reported on his claims to PBS, both for Medicare Part B and for Blue Shield business. At the population (or cohort) level, the characteristic price for the population (or cohort) is taken as the mean of the median prices for all of the individual physicians in the group. In order to more accurately represent the pricing behavior of each and every individual physician in the group, this was taken as the simple (unweighted) arithmetic mean of the individual physician medians. A weighted mean, in which high volume physicians would be represented with proportionately greater influence, may be appropriate where the objective is to emphasize overall impact on the total market; but the objective in this study was to characterize the average, or typical, pricing behavior of individual physicians -- and for this purpose, the simple unweighted mean is more appropriate.

2. Consistency of Individual Physician Prices

Section III.A.2, above, already has discussed the usefulness of the individual physician's CV as an indicator of his propensity toward either relatively consistent pricing practices or relatively more discriminatory pricing behavior. The mean of the individual physicians' CVs was calculated as an indicator of the characteristic tendency of physicians in the group to be consistent, or to be variable (possibly consciously discriminatory), in their pricing behavior. As suggested by

the earlier discussion, a low mean CV would indicate that the individual physicians in the population (or cohort) tend, on the average, to have relatively consistent pricing practices. Conversely, a higher mean CV would indicate that the individual physicians in the group (population or cohort) tend to have some variabilty in their pricing practices, and possibly may be exercising some price discrimination from case to case.

3. Consistency of Collective Pricing Behavior

The foregoing emphasizes the relative consistency (or lack of consistency) in individual physicians' pricing behaviors. It also is of interest to have some insight into the relative consistency or inconsistency of collective pricing behavior for the overall physician population, or for various subgroups of physicians. To this end, a coefficient of variation was calculated for the distribution of individual physicians' median prices. It should be expected that there will be some variability in characteristic pricing practices between different physicians. Moreover, as the size of the physician sample grows larger, the distribution of individual physician medians tends toward normality. On the whole, for any given procedure and cohort of physicians, the CV of individual physicians' medians should be expected to be somewhat larger than the mean CV for the same procedure and physician cohort. This follows from the fact that characteristic prices normally may be expected to vary from physician to physician, whereas given individual physicians usually would be expected to have an established single price, with relatively narrow (if any) variation, for a given service. If the CV of the distribution of median prices for a cohort of physicians is relatively

small, this reflects a relatively high level of agreement between physicians in the cohort on the price of the service in question. A relatively large CV of medians, conversely, would reflect a situation in which there is great variability and very little price agreement from physician to physician.

If the CV of medians is extremely small, there may be some temptation to take this as evidence of possible collusion or price fixing. While this may indeed be a viable possibility in some instances, it must be cautioned that a low CV of medians (high agreement between physicians) also may simply be reflecting a procedure that is particularly unambiguous in definition and content, on which different physicians have a high level of common understanding and for which there would be very little qualitative difference between physicians in delivering the service (i.e., different physicians place very similar intrinsic valuation upon the service).

4. Population Skewness

The skewness of the distribution of individual physicians' median prices (for a given procedure) was calculated in order to provide some more definitive information regarding the pricing behavior of physicians (as a group) relative to one another. Briefly reviewing the earlier discussion of skewness measures, a skewness of zero (or near zero) would indicate a situation in which most physicians "go down the middle" in their characteristic pricing practices for the given procedure, with a relatively small number of comparatively high-priced and low-priced physicians being more-or-less well balanced against one another, both in

terms of their numbers and in terms of the extent of their deviation from the most common pricing practice. A negative skewness value would indicate that most physicians are on the high side of the characteristic price range, with exceptions departing mostly to the low side; and a positive skewness would indicate that most physicians are concentrated on the low side of the characteristic price range, with exceptions departing mostly to the high side. The greater the magnitude of the skewness measure (either positive or negative), the more pronounced is the asymmetry of the distribution, and the more extreme is the departure of the exception cases from the most common pricing practice.

C. SUMMARY REVIEW OF KEY MEASURES

At the individual physician level, the pricing characteristics selected as being most useful, meaningful, and realizable were the median and CV of each individual physician's empirical fee distribution (for specific procedures). For each individual physician, these statistical measures characterize, respectively, the physician's most representative price for a given procedure, and the relative consistency or variability of his reported fees for the procedure. These individual physician measures are summarized among the population statistics described below.

At the population level, this study concentrated upon: (1) the means of individual physicians' median prices, by specific procedure; (2) the means of the CVs for individual physicians' fee data distributions, by procedure; (3) the CVs of the distributions of individual physicians' median charges, by specific procedure; and (4) the skewness of the

distributions of individual physicians' median charges for specific procedures. For practical interpretation, these measures represent, respectively: (1) the characteristic price typically charged by individual physicians within a cohort, for a given service; (2) the characteristic pricing consistency typical of physicians within a cohort, for a given service; (3) the degree of characteristic price agreement or variability between different physicians in a cohort, for a specific service; and (4) the general tendency for most physicians in a cohort to be low (high) priced, with exceptions from the main concentration of physicians being mainly higher (lower) priced. These population statistics are used to describe the pricing characteristics and behavior of the overall Pennsylvania physician population, as represented by the extensive sample drawn for this study, for specific topic procedures. Comparisons between and within cohorts of physicians emphasize primarily the first three of the above population measures. As discussed earlier, physician cohorts are defined in this study by specialty group and by geographic area (SMSA).

IV. AGGREGATE FINDINGS

This section presents aggregate findings for the statewide sample of all physicians represented in the study data base. Summary findings are presented separately for physicians in the Blue Shield component of the data base and for those in the Medicare Part B component. Findings for Blue Shield and Medicare then are compared.

A. PHYSICIAN PRICING FOR BLUE SHIELD COVERAGE

Table 2-1 summarizes overall findings on physician pricing behavior for services covered by Blue Shield. The findings reported here are derived from calendar year 1975 Blue Shield claims experience for 8,037 individual physicians. Data are displayed for each of the 44 topic procedures identified earlier in section II, organized by seven major generic categories of physician services: (1) general medical services and visits; (2) surgical procedures; (3) obstetrics; (4) anesthesia services; (5) diagnostic radiology; (6) diagnostic medical services; and (7) pathology. As explained and discussed previously in Section III, data for anesthesiology services are given on both an episode basis and a relative value unit basis. In addition to displaying aggregate physician pricing characteristics, the table indicates the number of individual physicians and the number of services represented for each of the listed procedures. Although the table is more or less self-explanatory, some additional general notes and observations follow below.

TABLE 2-1. STATEWIDE AVERAGE PHYSICIAN PRICES AND PRICING CHARACTERISTICS FOR SELECTED SERVICES COVERED BY BLUE SHIELD (1975)

Procedure	N Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Medical Services and Visits:							
Brief Office Visit	276	5,838	$ 8.59	.984	.055	.239	1.416
Intermediate Office Visit	239	5,754	10.27	1.176	.046	.246	1.897
Home Visit	0	0	-	-	-	-	-
Initial Hospital Visit	3,785	189,175	36.51	4.182	.054	.298	.783
Brief Hospital Visit	2,982	431,871	8.37	.959	.075	.370	1.004
Intermediate Hospital Visit	4,446	906,301	12.06	1.381	.084	.354	1.472
Comprehensive Consultation	2,179	100,923	41.62	4.767	.071	.300	.799
Surgical Procedures:							
Excision of Breat Cyst	212	4,189	137.05	15.699	.150	.262	.427
Arthrocentesis	1,034	61,704	17.71	2.029	.110	.333	.975
Colles Fracture	159	3,494	144.60	16.564	.189	.259	.658
Tonsillectomy (Child)	193	5,742	133.87	15.334	.059	.243	.656
Tonsillectomy (Adult)	151	4,026	149.83	17.163	.066	.200	.303
Appendectomy	167	2,766	272.20	31.180	.066	.190	.000
Proctosigmoidoscopy	911	62,707	26.19	3.000	.072	.329	.900
Cholecystectomy	231	4,095	430.01	49.257	.048	.152	.200
Herniorrhaphy	268	5,110	273.24	31.299	.065	.185	.165
TUR Prostate	84	1,502	538.39	61.671	.063	.140	.168
Dilation and Curettage (D&C)	369	10,687	131.32	15.042	.134	.255	.360
Hysterectomy	310	6,126	490.83	56.223	.052	.171	.630
Laminotomy (Herniated Disc)	59	1,824	676.22	77.459	.072	.192	.000
Lens Extraction	83	1,546	527.80	60.458	.039	.145	.051
Obstetrics:							
Vaginal Delivery	689	38,781	328.95	37.680	.054	.224	.046

TABLE 2-1. (CONTINUED -- Page 2 of 3)

Procedure	N Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Anesthesia (by Episode):							
for Ex. Breast Cyst	75	2,474	$ 62.51	7.160	.150	.236	1.682
for Tonsillectomy (Child)	68	2,199	78.06	8.942	.101	.174	.681
for Tonsillectomy (Adult)	53	1,149	80.17	9.183	.116	.161	.632
for Appendectomy	78	2,020	104.00	11.913	.139	.164	.633
for Cholecystectomy	80	2,669	133.07	15.243	.146	.208	1.501
for Herniorrhaphy	98	3,290	86.90	9.954	.173	.216	1.343
for TUR Prostate	40	793	97.72	11.194	.174	.217	1.691
for D&C	98	5,189	50.32	5.764	.160	.185	.933
for Hysterectomy	110	4,325	141.40	16.197	.146	.183	.955
for Laminotomy	40	879	162.21	18.581	.134	.181	.683
for Lens Extraction	28	1,138	106.39	12.187	.170	.341	.171
Anesthesia (by Unit of Service):							
for Ex. Breast Cyst	75	16,067	9.81	1.124	.076	.144	.553
for Tonsillectomy (Child)	68	17,857	9.69	1.110	.062	.133	.388
for Tonsillectomy (Adult)	53	11,955	9.70	1.111	.071	.132	-.148
for Appendectomy	78	21,792	9.75	1.117	.077	.120	.192
for Cholecystectomy	80	37,086	9.67	1.108	.071	.134	.889
for Herniorrhaphy	98	29,253	9.90	1.134	.077	.140	.452
for TUR Prostate	40	7,978	9.91	1.135	.079	.143	.218
for D&C	98	26,990	9.93	1.137	.091	.143	.536
for Hysterectomy	110	62,804	9.84	1.127	.068	.131	.480
for Laminotomy	40	14,467	9.92	1.136	.066	.128	.086
for Lens Extraction	28	14,440	8.31	.952	.122	.270	-.246

TABLE 2-1. (CONTINUED -- Page 3 of 3)

Procedure	N Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Diagnostic Radiology:							
Chest X-ray	423	100,722	$ 23.39	2.679	.039	.172	.418
Knee X-ray	245	19,790	23.43	2.684	.100	.257	1.159
Upper GI	192	24,050	47.90	5.487	.036	.184	.887
Barium Enema	115	8,881	42.65	4.885	.041	.202	.327
Cholestography	170	13,070	34.07	3.903	.039	.171	.423
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2,499	286,084	20.54	2.353	.037	.210	.641
Electroencephalogram (EEG)	43	7,070	47.36	5.425	.087	.274	-.326
Pathology:							
Urinalysis	704	69,081	3.74	.428	.056	.342	1.227
Cholesterol Blood Test	551	34,101	5.82	.667	.056	.326	3.604
Fasting Blood Sugar (FBS)	1,038	65,390	4.90	.561	.049	.253	1.147
Complete Blood Count (CBC)	1,009	92,829	6.53	.748	.056	.270	1.200

It should be noted that PBS has only a limited number of subscribers covered for office visits. This is a category of services not normally included in Blue Shield benefit packages, and it has been provided to only a small number of Blue Shield group accounts under specially designed packages. This therefore accounts for substantially smaller numbers of doctors and services than one might otherwise expect for office visits. Nevertheless, the samples still are of sufficient size; and moreover, the office visit claims represented here come from several different parts of the state, so that there should be no particular geographic bias in the aggregate statistics.

Average prices listed in the table are "average price per physician," not "average price per service." Specifically, as pointed out in Section III.B.1, the average given here is an unweighted arithmetic mean of the individual representative fees (for a specific procedure) calculated across all of the individual doctors represented, with each individual doctor's representative fee taken as the median of his distribution of fees for a procedure. An unweighted mean is used because the intent here is to have the individual physician as the unit of observation, without distinguishing between high volume and low volume physicians.

It should be noted that actual prices listed in the table are 1975 prices, whereas the prices of physicians' services in Pennsylvania have gone up as much as 75 to 85 percent from 1975 to 1982. To escape the temporal inflationary effects associated with specific price level data, all specific prices have been converted to Relative Price Units (RPUs), and these also are listed in the table. The base for this conversion was the Medicare brief office visit. The RPU for each procedure thus is the

average price value for the procedure, expressed as a multiple of the average price value of a Medicare brief office visit. The net gain in converting price data to RPUs is the provision of a set of abstract values that reflect the relative scaling of the empirically observed price valuations for the several procedures without being unduly distracted or misled by specific price levels pegged to a specific point in time.

Mean CV, reflecting the average consistency of individual physicians' pricing behaviors, ranges from .036 (upper GI study) to .189 (reduction of Colles fracture). With the exception of episode-based anesthesia services, the great majority of procedures have mean CVs falling in an even narrower range from .050 to .080.

Some part of the individual physician price variation reflected in the mean CVs is attributable to routine price changes. Underlying variation due to price changes must be accepted here as a hidden and somewhat unknown factor, since no information was gathered or generated on the exact number, extent, or timing of price changes by individual physicians during the course of the year spanned by the data base. (Such information could have been obtainable in principle, but practical EDP and analytical demands were prohibitive.) On the other hand, it is possible to establish at least a reasonable intuitive sense of the underlying variation due to routine price changes. It can be shown, for instance, that each single percent of a mid-year price change will generate an increase of slightly less than .005 in the individual physician's CV. (Mid-year timing in a price change would maximize the impact in terms of variation in the fee data distribution, and hence would cause the greatest increase in CV, assuming equal service volumes in both halves of the

year.) Thus, as a specific example, we can know that a CV of .050 could be explained almost completely as the effect of a 10 percent mid-year price increase. In this light, a mean CV substantially greater than .050 could be interpreted as suggesting either some price discrimination or relatively large and/or frequent price increases, or both. A mean CV less than .050 not only would suggest little or no price discrimination; it also would suggest relatively limited price change.

The generally quite small mean CVs shown in Table 2-1 thus suggest some, but very little, price discrimination in Blue Shield services at the individual physician level. The mean CVs for some of the diagnostic services (x-rays, EKGs, etc.) seem to reflect individual provider pricing practices that are particularly tightly constrained and disciplined. The relatively large CV for reduction of a Colles fracture, incidentally, may have more to do with variation in how cases present clinically than with discriminating price behavior, per se. In general, procedures with greater degrees of ambiguity in the precise definition of the service, or which are relatively less uniform in terms of the amount of physician output required in order to perform the service from case to case, will have an intrinsic tendency toward larger CVs. This effect may be noticed in the mean CVs calculated for anesthesiology services on an episode basis. The relatively high mean CVs for episode-based data on anesthesiology services probably reflect legitimate case-to-case variation in the clinical situations involved. The unit-based CVs for anesthesiology services are comparatively more tight and stable.

The CV of medians, as discussed in Section III.B.3, provides a measure of the degree of agreement (or disagreement) between different

physicians regarding characteristic price for a given procedure. In contrast to the mean CV, which measured the average consistency of individual physicians' pricing practices, the CV of medians measures the consistency of pricing from doctor to doctor within a population of physicians. Interpretation of the exact meaning that may be attached to given values of the CV of medians is highly subjective. The following arbitrary guidelines are suggested: (1) values at or near .200, ranging up to .299, probably indicate more-or-less typical random variation and may be interpreted as representing degrees of variation consistent with normal group behavior; (2) values beyond .300 would reflect increasingly disparate behavior in a cohort of physicians, with no particularly strong sense of agreement between physicians regarding an appropriate price for a given service; (3) values substantially smaller than .200 would reflect a rather unusually small range of variation in pricing practices between physicians, and may be interpreted as indicating uncommonly uniform pricing behavior within a group.

The CVs of medians listed in Table 2-1 indicate a degree of characteristic price variation from physician to physician that is rather as might be expected in most instances. Most procedures show variation, but not excessive variation, consistent with approximately normal statistical population behavior. Anesthesiology (unit-based data) and radiology appear as areas in which there is a relatively high level of agreement between doctors. In contrast, there appears to be a relatively low level of agreement between physicians on pricing for hospital visits, for some pathology services, and for minor surgical procedures commonly performed in the office setting (arthrocentesis and proctosigmoidoscopy).

In general, the population CVs found in this study appear somewhat smaller than those reported in previous literature, although still falling generally within the range found in other studies.

Population skewness, as discussed in Section III.B.4, provides an indication of the relative tendency of physicians in a population to be concentrated on either the high side or the low side of the characteristic price range represented in the population. Zero skewness indicates a well balanced distribution, with physicians deviating in reasonable numbers more-or-less equally to the high side and low side of the price level characteristically charged by the main concentration of physicians. Progressively larger skewness values indicate progressively less symmetric distributions. Interpretation of the exact meaning of a given skewness magnitude again is subjective and quite arbitrary. Essentially, it entails a judgment as to how far a distribution may depart from perfect symmetry, and still be called "nearly symmetric" or "symmetric enough." For present purposes, let us say that anything up to an absolute value of 1.000 represents a reasonably well balanced distribution. Values larger than this would indicate increasingly severe concentrations on either the high side or the low side of the distribution, with increasingly severe exceptions tailing off to the opposite end of the range. As noted before, negative skewness indicates that the main concentration of physicians is on the high side of the characteristic price range, with a few relatively extreme exceptions on the low end of the range. Positive skewness indicates, conversely, relatively lower characteristic prices for the main concentration of physicians, with higher priced physicians being the exception.

The population skewness statistics in Table 2-1 indicate that, for office visits and for hospital visits (other than an initial visit), most physicians have characteristic fees that are on the high side of the range for these services. The low priced physician for these services is the exception. Physicians who perform pathology services are similarly distributed with respect to their pricing practices for pathology procedures. Most other procedures included in this study appear to be reasonably well balanced between physicians with relatively high or relatively low characteristic prices, but tending slightly toward concentration on the high side of the price range.

B. PHYSICIAN PRICING FOR MEDICARE PART B SERVICES

Table 2-2 is a parallel summary of overall findings on physician pricing behavior for 10,347 individual physicians reporting services for topic procedures under Medicare Part B. As in the preceding table, the display indicates the number (N) of physicians and services represented for each procedure. The 1975 average price data again have been converted to Relative Price Units (RPUs), with the RPUs -- as before -- representing multiples of the average characteristic price of a Medicare brief office visit. Mean CV, CV of medians, and population skewness have the same meanings and interpretations as discussed above in relation to the Blue Shield data in Table 2-1.

The mean CV data again show certain diagnostic procedures to have more tightly constrained and disciplined individual physician pricing behavior than is evidenced for most other procedures. Medicare office

TABLE 2-2. STATEWIDE AVERAGE PHYSICIAN PRICES AND PRICING CHARACTERISTICS SELECTED SERVICES COVERED BY MEDICARE PART B (1975)

Procedure	N Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Medical Services and Visits:							
Brief Office Visit	7,418	1,642,568	$ 8.73	1.000	.165	.292	.906
Intermediate Office Visit	6,462	1,789,605	10.97	1.257	.116	.325	1.363
Home Visit	1,727	194,435	12.82	1.468	.084	.292	.940
Initial Hospital Visit	3,653	229,813	36.29	4.157	.062	.306	.771
Brief Hospital Visit	3,559	767,119	8.52	.976	.076	.357	.850
Intermediate Hospital Visit	4,562	1,811,482	11.85	1.357	.069	.341	1.399
Comprehensive Consultation	2,358	142,699	41.35	4.737	.077	.302	.829
Surgical Procedures:							
Excision of Breast Cyst	3	45	172.33	19.740	.221	.044	.199
Arthrocentesis	777	37,334	17.03	1.951	.146	.331	.932
Colles Fracture	41	727	151.33	17.334	.148	.244	.649
Tonsillectomy (Child)	0	0	-	-	-	-	-
Tonsillectomy (Adult)	0	0	-	-	-	-	-
Appendectomy	0	0	-	-	-	-	-
Proctosigmoidoscopy	771	31,510	26.49	3.034	.102	.326	.820
Cholecystectomy	54	724	419.66	48.071	.076	.130	.652
Herniorrhaphy	142	2,306	279.02	31.961	.081	.202	.173
TUR Prostate	194	8,433	558.50	63.975	.089	.166	-.018
Dilation and Curettage (D&C)	14	166	126.43	14.482	.112	.189	.586
Hysterectomy	4	53	543.75	62.285	.063	.095	.200
Laminotomy (Herniated Disc)	4	83	721.25	82.617	.082	.114	.650
Lens Extraction	297	12,745	535.07	61.291	.045	.161	.432
Obstetrics:							
Vaginal Delivery	0	0	-	-	-	-	-

TABLE 2-2. (CONTINUED -- Page 2 of 3)

Procedure	N Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Anesthesia (by Episode):							
for Ex. Breast Cyst	11	171	$ 74.05	8.482	.186	.161	.620
for Tonsillectomy (Child)	0	0	-	-	-	-	-
for Tonsillectomy (Adult)	0	0	-	-	-	-	-
for Appendectomy	0	0	-	-	-	-	-
for Cholecystectomy	38	909	136.89	15.680	.171	.202	.754
for Herniorrhaphy	64	1,618	95.63	10.954	.183	.239	1.358
for TUR Prostate	98	3,699	106.82	12.236	.170	.178	.609
for D&C	15	278	61.72	7.070	.185	.175	.081
for Hysterectomy	7	93	142.00	16.266	.150	.000	.048
for Laminotomy	0	0	-	-	-	-	-
for Lens Extraction	68	4,603	113.99	13.057	.136	.303	-.088
Anesthesia (by Unit of Service):							
for Ex. Breast Cyst	11	1,277	9.95	1.140	.086	.132	.943
for Tonsillectomy (Child)	0	0	-	-	-	-	-
for Tonsillectomy (Adult)	0	0	-	-	-	-	-
for Appendectomy	0	0	-	-	-	-	-
for Cholecystectomy	38	13,252	9.74	1.116	.094	.131	.813
for Herniorrhaphy	64	16,043	9.83	1.126	.097	.145	.955
for TUR Prostate	98	40,417	9.64	1.104	.088	.133	.845
for D&C	15	1,710	10.41	1.192	.101	.185	.833
for Hysterectomy	14	2,728	10.14	1.162	.069	.125	-.453
for Laminotomy	0	0	-	-	-	-	-
for Lens Extraction	67	45,178	8.68	.994	.096	.237	-.419

TABLE 2-2. (CONTINUED -- Page 3 of 3)

Procedure	N. Doctors	Nr. Services	Avg. Price	Avg. RPU	Mean CV	CV of Medians	Population Skewness
Diagnostic Radiology:							
Chest X-ray	389	45,656	$ 23.38	2.678	.051	.167	.567
Knee X-ray	131	4,715	23.22	2.660	.118	.255	1.535
Upper GI	156	8,358	48.36	5.540	.061	.190	.844
Barium Enema	111	4,951	42.62	4.882	.058	.204	.339
Cholestography	104	3,137	33.61	3.850	.053	.177	.742
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2,351	249,376	20.26	2.321	.060	.210	.691
Electroencephalogram (EEG)	26	3,363	45.50	5.212	.098	.278	-.151
Pathology:							
Urinalysis	1,812	211,342	3.25	.372	.100	.363	1.390
Cholesterol Blood Test	713	50,085	5.62	.644	.061	.299	3.480
Fasting Blood Sugar (FBS)	2,091	263,490	4.57	.523	.070	.254	.986
Complete Blood Count (CBC)	1,392	162,391	6.19	.709	.077	.275	1.258

visits and certain surgical procedures, on the other hand, exhibit a relatively high level of variability for individual physicians on the average. Some price discrimination may be indicated here.

The CV of medians shows patterns slightly more mixed than those observed for Blue Shield services. As previously observed for Blue Shield services, there is a relatively high level of price agreement between physicians for diagnostic radiology services. Anesthesiology services also appear again as an area in which there is price agreement between physicians, but the agreement is less strong than that observed for Blue Shield services. Also as before, there is a generally low level of agreement between physicians on prices for office visits, hospital visits, and minor surgical procedures typically performed in the office setting.

C. COMPARISON OF PRICING PRACTICES UNDER MEDICARE AND BLUE SHIELD

Combining selected data items from Tables 2-1 and 2-2, Table 2-3 presents a summary comparison of physician pricing practices for services delivered under the Blue Shield and Medicare programs.

Price data in Table 2-3 are shown only as RPUs. A column has been added to display the ratio of the characteristic Medicare price to the characteristic Blue Shield price (for procedures represented for both programs in the data base). If this ratio is greater than 1.000 the Medicare price is higher; and conversely, if the ratio is less than 1.000, the Medicare price is lower. The amount by which this ratio differs from 1.000 can be translated directly into a percentage difference

TABLE 2-3. COMPARISON OF BLUE SHIELD AND MEDICARE STATEWIDE AVERAGE PRICES FOR SELECTED PHYSICIAN SERVICES

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	.984	1.000	1.106	.055	.165	.239	.292
Intermediate Office Visit	1.176	1.257	1.069	.046	.116	.246	.325
Home Visit	-	1.468	-	-	.084	-	.292
Initial Hospital Visit	4.182	4.157	.994	.054	.062	.298	.306
Brief Hospital Visit	.959	.976	1.018	.075	.076	.370	.357
Intermediate Hospital Visit	1.381	1.357	.983	.084	.069	.354	.341
Comprehensive Consultation	4.767	4.737	.994	.071	.077	.300	.302
Surgical Procedures:							
Excision of Breast Cyst	15.699	19.740	1.257	.150	.221	.262	.044
Arthrocentesis	2.029	1.951	.962	.110	.146	.333	.331
Colles Fracture	16.564	17.334	1.046	.189	.148	.259	.244
Tonsillectomy (Child)	15.334	-	-	.059	-	.243	-
Tonsillectomy (Adult)	17.163	-	-	.066	-	.200	-
Appendectomy	31.180	-	-	.066	-	.190	-
Proctosigmoidoscopy	3.000	3.034	1.011	.072	.102	.329	.326
Cholecystectomy	49.257	48.071	.976	.048	.076	.152	.130
Herniorrhaphy	31.299	31.961	1.021	.065	.081	.185	.202
TUR Prostate	61.671	63.975	1.037	.063	.089	.140	.166
Dilation and Curettage (D&C)	15.042	14.482	.963	.134	.112	.255	.189
Hysterectomy	56.233	62.285	1.108	.052	.063	.171	.095
Laminotomy (Herniated Disc)	77.459	82.619	1.067	.072	.082	.192	.114
Lens Extraction	60.458	61.291	1.014	.039	.045	.145	.161
Obstetrics:							
Vaginal Delivery	37.680	-	-	.054	-	.224	-

TABLE 2-3. (CONTINUED -- Page 2 of 3)

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Anesthesia (by Episode):							
for Ex. Breast Cyst	7.160	8.482	1.185	.150	.186	.236	.161
for Tonsillectomy (Child)	8.942	-	-	.101	-	.174	-
for Tonsillectomy (Adult)	9.183	-	-	.116	-	.161	-
for Appendectomy	11.913	-	-	.139	-	.164	-
for Cholecystectomy	15.243	15.680	1.029	.146	.171	.208	.202
for Herniorrhaphy	9.954	10.954	1.100	.173	.183	.216	.239
for TUR Prostate	11.194	12.236	1.093	.174	.170	.217	.178
for D&C	5.764	7.070	1.227	.160	.185	.185	.175
for Hysterectomy	16.197	16.266	1.004	.146	.150	.183	.000
for Laminotomy	18.581	-	-	.134	-	.181	-
for Lens Extraction	12.187	13.057	1.071	.170	.136	.341	.303
Anesthesia (by Unit of Service)							
for Ex. Breast Cyst	1.124	1.140	1.014	.076	.086	.144	.132
for Tonsillectomy (Child)	1.110	-	-	.062	-	.133	-
for Tonsillectomy (Adult)	1.111	-	-	.071	-	.132	-
for Appendectomy	1.117	-	-	.077	-	.120	-
for Cholecystectomy	1.108	1.116	1.007	.071	.094	.134	.131
for Herniorrhaphy	1.134	1.126	.993	.077	.097	.140	.145
for TUR Prostate	1.135	1.104	.973	.079	.088	.143	.133
for D&C	1.137	1.192	1.048	.091	.101	.143	.185
for Hysterectomy	1.127	1.162	1.031	.068	.068	.131	.125
for Laminotomy	1.136	-	-	.066	-	.128	-
for Lens Extraction	.952	.994	1.044	.122	.096	.270	.237

TABLE 2-3. (CONTINUED -- Page 3 of 3)

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Diagnostic Radiology:							
Chest X-ray	2.679	2.678	1.000	.039	.051	.172	.167
Knee X-ray	2.684	2.660	.991	.100	.118	.257	.255
Upper GI	5.487	5.540	1.010	.036	.061	.184	.190
Barium Enema	4.885	4.882	.999	.041	.058	.202	.204
Cholestography	3.903	3.850	.986	.039	.053	.171	.177
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2.353	2.321	.986	.037	.060	.210	.210
Electroencephalogram (EEG)	5.425	5.212	.961	.087	.098	.274	.278
Pathology:							
Urinalysis	.428	.372	.869	.056	.100	.342	.363
Cholesterol Blood Test	.667	.644	.966	.056	.061	.326	.299
Fasting Blood Sugar (FBS)	.561	.523	.932	.049	.070	.253	.254
Complete Blood Count (CBC)	.748	.709	.948	.056	.077	.270	.275

between the representative Medicare price and the representative Blue Shield price for the same procedure. The table value of 1.106 at the top of the ratio column shows, for example, that the average physician charges Medicare beneficiaries 10.6 percent more for a brief office visit than is charged on the average by physicians serving Blue Shield subscribers. For arthrocentesis (under the surgical procedure group), the listed ratio of .962 differs from 1.000 by .038, indicating that the average physician performing this service for a Medicare beneficiary charges 3.8 percent less than is charged by the average doctor performing the same service for a Blue Shield subscriber.

Comparing average relative price levels for Medicare and Blue Shield, the results for general medical services and visits are mixed. For the six procedures on which there is common experience, the Medicare price is higher on three and lower on the other three. Medicare office visit fees are substantially higher than for Blue Shield; but for hospital visits and consultation there is very little difference.

In the surgical procedure group, the Medicare price is higher on eight, and lower on three, of the procedures for which there is common experience. The price difference is really sizable only for excision of breast cyst, for hysterectomy, and for laminotomy (herniated disc). All of these are represented by very few physicians and comparatively few services for Medicare, however. In general, (reflected from Tables 2-1 and 2-2) there is relatively less surgery under the Medicare program than under the Blue Shield program. Arthrocentesis and proctosigmoidoscopy, both of which are most commonly performed in the office setting, have high volumes in Medicare as well as in Blue Shield. For these, the Medicare

price is slightly lower for arthrocentesis and very slightly higher for proctosigmoidoscopy. Among the remaining surgical procedures examined, there is substantial Medicare incidence only for herniorrhaphy, TUR prostate, and lens extraction (not surprising, since these are procedures related to problems with higher rates of incidence among the elderly). For all three of these particular procedures, the average physician's price is marginally higher to Medicare.

Average physicians' prices for anesthesiology services, when examined on an episode basis, are quite a bit higher on the whole for Medicare than for Blue Shield. It may be surmised, however, that a large part of this difference is a reflection of clinical differences having to do with patient age and general physical condition. When examined on a relative value unit basis, anesthesiology services for Medicare still are higher for many procedures, but the difference in most instances is relatively marginal.

Diagnostic radiology services have extremely close price levels between the two programs. Prices for diagnostic medical services are marginally lower for the Medicare program. Typical physicians' prices for pathology services are lower in the Medicare program by proportions ranging from 3.4 percent to 13.1 percent.

The two columns of mean CV data provide a comparison of the relative consistency of individual physician pricing practices between these two programs. For office visits, there is a considerable difference, with higher values for Medicare suggesting that individual physicians are prone to use a greater variety of different prices for their Medicare patients, possible discriminating on a case-to-case or patient-to-patient basis.

For hospital visits and consultation, there is very little difference in mean CV between Medicare and Blue Shield.

The Medicare mean CV is larger than the Blue Shield mean CV on nine of the eleven surgical procedures the two programs have in common. The Medicare values are higher for all of the listed surgical procedures with high incidence under Medicare (arthrocentesis, proctosigmoidoscopy, herniorrhaphy, TUR prostate, and excision of lens). The differences are not very great, however. These results could be interpreted as suggesting that individual physicians who perform surgical procedures have a very faint tendency toward more price discrimination with Medicare patients.

There is no appreciable difference in mean CV between Medicare and Blue Shield for anesthesiology services. Physicians who perform anesthesiology services apparently make very little differentiation in their pricing practices for these two programs.

The comparative mean CV values for all diagnostic services and tests suggest that individual physicians performing these services exhibit slightly greater diversity in their prices for Medicare patients than for Blue Shield patients. Again, however, the differences are slight.

The comparative data patterns for CV of medians for Blue Shield and Medicare are quite similar and very close to one another. The pattern is just slightly more mixed in Medicare. To the extent that differences do appear, there is no consistent pattern to the difference. Sometimes the Blue Shield value is higher, sometimes Medicare. The only large differences are for a few surgical procedures which already have been identified as having small Medicare physician and incidence samples, therefore possibly not being truly representative. The level of agreement

between physicians on pricing practices does not appear to be markedly different between the two programs.

V. FINDINGS WITHIN SPECIALTY GROUPS

Intuition, theory, and common experience all suggest differences between specialists and generalists, and between various types of specialists. The primary consideration in setting specialists apart from generalists, and in differentiating between various types of specialists, is that the specialist is presented as having especially high levels of skills, training, and general expertise relative to particular types of services. This translates into a presumed higher quality of service obtainable from a specialist performing services in his special area of expertise, which in turn has implications for the level of prices a specialist can command in the marketplace for his services.

When physicians are viewed as a single overall population, these distinctions become blurred. The analysis thus is sharpened by controlling for specialty, even if only at the level of broad specialty classes. In this section, there are separate examinations of characteristic pricing behaviors for each of five broad specialty groups: (a) generalists, including physicians in general practice and family practice; (b) medical specialists; (c) surgical specialists; (d) anesthesiologists; and (e) other specialists. A priori expectations would include higher prices for specialists working in their special areas of expertise, and perhaps more consistent and sharply focused collective pricing behavior within groups as the respective cohorts of physicians become relatively more homogeneous in terms of the types and levels of skills and training represented.

A. GENERAL AND FAMILY PRACTICE

Table 2-4 presents a summary of generalist physician pricing characteristics for both Blue Shield and Medicare, paralleling the information presented in Table 2-3 for the overall physician population.

As expected, generalists' price levels are uniformly lower than for the population of physicians as a whole, with the exception of pathology services. For pathology services, generalist prices are approximately the same as those indicated for the overall physician population. General/family practice physicians appear to give a slightly greater price break to Medicare patients, as indicated in the ratio column, than is true of physicians as a whole. This occurs most dramatically for office visits, where the average generalist's brief office visit price for Medicare is seen to be 7.2 percent lower than for Blue Shield, compared to being 10.6 percent higher in the same comparison for all physicians.

As measured by the mean CV, general/family practice physicians appear to be generally more consistent in their individual pricing behaviors than was observed for all physicians, suggesting that on the whole they discriminate less. The improvement in individual physician pricing consistency (or apparent reduction in discrimination) is rather slight, however, for most procedures. A notable exception to the general pattern observed here is the brief office visit. For this procedure, the average individual generalist physician exhibits considerable variability in his pricing to Blue Shield patients, quite possibly price discriminating; but the average generalist then also appears to have little or no price discrimination under Medicare. This is precisely opposite to the

TABLE 2-4. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR SELECTED SERVICES PERFORMED BY PHYSICIANS IN GENERAL/FAMILY PRACTICE

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	.940	.872	.928	.147	.054	.218	.177
Intermediate Office Visit	1.048	1.032	.985	.045	.110	.155	.232
Home Visit	-	1.386	-	-	.089	-	.271
Initial Hospital Visit	3.623	3.519	.971	.044	.053	.259	.262
Brief Hospital Visit	.853	.860	1.008	.068	.073	.336	.333
Intermediate Hospital Visit	1.227	1.196	.975	.075	.065	.357	.335
Comprehensive Consultation	3.946	3.939	.998	.050	.058	.336	.312
Surgical Procedures:							
Arthrocentesis	1.969	1.864	.947	.096	.130	.323	.333
Tonsillectomy (Child)	11.294	-	-	.076	-	.124	-
Proctosigmoidoscopy	2.427	2.330	.960	.057	.067	.339	.348
Obstetrics:							
Vaginal Delivery	26.023	-	-	.053	-	.210	-
Diagnostic Radiology:							
Chest X-ray	2.606	2.667	1.023	.053	.058	.191	.187
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2.315	2.266	.979	.036	.061	.229	.231
Pathology:							
Urinalysis	.425	.347	.816	.059	.115	.329	.363
Cholesterol Blood Test	.677	.655	.968	.058	.064	.276	.267
Fasting Blood Sugar (FBS)	.565	.515	.912	.047	.074	.245	.262
Complete Blood Count (CBC)	.756	.710	.939	.057	.082	.241	.250

observation for all physicians, where there was a suggestion of discrimination under Medicare, but little or none under Blue Shield.

The level of agreement in pricing between different physicians, as reflected by the CV of medians, is greater within the cohort of general/family practice physicians than was observed for the overall physician population, for most procedures. For generalists performing chest x-rays and EKGs, the level of agreement between physicians is not as good as for all physicians, but still is quite good in absolute terms. There is poor agreement between generalist physicians on prices for follow-up hospital visits, for consultations, and for minor surgical procedures performed in the office setting.

B. MEDICAL SPECIALTIES

Comparative summary characteristics of Blue Shield and Medicare prices for physicians in medical specialties are displayed in Table 2-5. Again as expected, medical specialists' prices for general medical services, visits, consultations, and diagnostic medical services are higher than the averages for all physicians. They are marginally lower, however, for the minor surgical procedures (arthrocentesis and proctosigmoidoscopy). Medical specialists' prices also are uniformly lower than average for diagnostic radiology services. For pathology services, Medical specialists' prices are more-or-less average. Consistent with their training and general philosophy of practice, medical specialists tend to perform very little, if any, definitive surgery and thus are not listed for these kinds of procedures.

TABLE 2-5. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR SELECTED SERVICES PERFORMED BY PHYSICIANS IN MEDICAL SPECIALTIES

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	1.053	1.090	1.035	.062	.160	.321	.276
Intermediate Office Visit	1.354	1.356	1.001	.041	.103	.248	.288
Home Visit	-	1.702	-	-	.075	-	.283
Initial Hospital Visit	4.669	4.777	1.023	.055	.060	.276	.275
Brief Hospital Visit	1.027	1.105	1.076	.071	.069	.365	.316
Intermediate Hospital Visit	1.467	1.478	1.007	.081	.064	.328	.303
Comprehensive Consultation	5.223	5.245	1.004	.063	.065	.275	.274
Surgical Procedures:							
Arthrocentesis	1.903	1.867	.981	.088	.137	.313	.305
Proctosigmoidoscopy	2.711	2.743	1.012	.056	.070	.283	.293
Diagnostic Radiology:							
Chest X-ray	2.623	2.627	1.002	.041	.051	.156	.151
Knee X-ray	2.395	-	-	.090	-	.235	-
Upper GI	5.132	5.097	.993	.035	.059	.200	.212
Barium Enema	4.767	4.564	.957	.021	.034	.200	.178
Cholestography	3.769	3.589	.952	.040	.036	.180	.165
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2.364	2.338	.989	.038	.060	.195	.195
Pathology:							
Urinalysis	.423	.383	.905	.052	.086	.341	.363
Cholesterol Blood Test	.655	.638	.974	.053	.050	.336	.334
Fasting Blood Sugar (FBS)	.553	.529	.957	.050	.062	.238	.242
Complete Blood Count (CBC)	.737	.708	.961	.056	.069	.285	.290

In general, medical specialists do not appear to be giving any price breaks to Medicare for general medical services and visits, which comprise the medical specialist's main stock in trade. They do, however, give a better than average price advantage to Medicare for most diagnostic radiology services. They also give a price advantage to Medicare for EKG and pathology services, but on the whole not as great a price break as the average for all physicians.

The pattern for degree of consistency in individual physicians' pricing practices (mean CV) is quite similar to that observed for all physicians. In general, the mean CVs in this table suggest very little price discrimination at the individual physician level for the various categories of diagnostic services. Some mild price discrimination might be indicated for Medicare office visits and for Medicare arthrocentesis. For all other visits, consultations, and minor (office setting) surgical procedures, the data suggest a possibility of some -- but very little -- price discrimination. For most procedures, the comparative mean CV data indicate somewhat more extensive individual physician price discrimination (or price changes) for Medicare than for Blue Shield.

The price agreement between physicians (CV of medians) is relatively low for Blue Shield brief office visits and for follow-up hospital visits under both programs. For all other visits and consultations, agreement is about average. Agreement is generally good in diagnostic medical services and diagnostic radiology. For minor surgery and for pathology services, price agreement between medical specialists ranges from fair to poor. In general, the agreement between physicians within this cohort appears to be a little bit tighter than among all physicians.

C. SURGICAL SPECIALTIES

Table 2-6 lists the comparative prices of Blue Shield and Medicare prices for services by surgical specialists.

Surgical specialists are shown to have greater than average prices for office visits, but prices for other visits and consultations that are approximately average or lower. The relative price levels listed for surgical specialists for surgical procedures are very close to the averages for all physicians, but this is simply because most surgery is performed by surgical specialists. Surgical specialists tend to vary around the all physician average prices for diagnostic radiology, to have slightly high prices for diagnostic medical services, and to have relatively high prices for pathology services.

Surgical specialists are shown to give a slight, but smaller than average, price break to Medicare patients for brief office visits. They give a much greater than average price break (17.3 percent) to Medicare patients for intermediate office visits. For hospital visits and consultations, surgical specialists tend to have Medicare prices and Blue Shield prices that are very close to one another, with a very small price advantage in favor of Medicare; and in this respect they are quite similar to the averages for all physicians. For surgical procedures, there is an even split between higher Medicare prices and higher Blue Shield prices. The procedures for which Medicare prices are higher include those with higher incidence among the elderly, however. Surgical specialists tend to give a greater than average price differential to Medicare for pathology services, although their general price levels for

TABLE 2-6. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR SELECTED SERVICES PERFORMED BY PHYSICIANS IN SURGICAL SPECIALTIES

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	1.082	1.102	1.018	.058	.195	.271	.292
Intermediate Office Visit	1.200	1.407	1.173	.045	.135	.253	.314
Home Visit	-	1.449	-	-	.068	-	.294
Initial Hospital Visit	3.976	3.993	1.004	.066	.079	.281	.277
Brief Hospital Visit	.986	.978	.992	.084	.087	.375	.364
Intermediate Hospital Visit	1.384	1.344	.971	.096	.081	.352	.340
Comprehensive Consultation	4.258	4.219	.991	.085	.094	.289	.291
Surgical Procedures:							
Excision of Breast Cyst	15.740	-	-	.149	-	.260	-
Arthrocentesis	2.163	2.064	.954	.137	.166	.337	.336
Colles Fracture	16.545	17.296	1.045	.189	.148	.260	.248
Tonsillectomy (Child)	15.526	-	-	.058	-	.240	-
Tonsillectomy (Adult)	17.182	-	-	.067	-	.199	-
Appendectomy	31.220	-	-	.064	-	.190	-
Proctosigmoidoscopy	3.353	3.306	.986	.085	.124	.302	.308
Cholecystectomy	49.305	48.071	.975	.047	.076	.151	.130
Herniorrhaphy	31.283	31.975	1.022	.065	.080	.186	.203
TUR Prostate	61.449	63.835	1.039	.063	.088	.137	.167
Dilation and Curettage (D&C)	15.052	14.482	.962	.133	.112	.254	.189
Hysterectomy	56.259	-	-	.052	-	.170	-
Laminotomy (Herniated Disc)	78.005	-	-	.074	-	.185	-
Lens Extraction	60.458	61.208	1.024	.039	.045	.145	.159
Obstetrics:							
Vaginal Delivery	39.667	-	-	.054	-	.182	-

TABLE 2-6. (CONTINUED -- Page 2 of 2)

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Diagnostic Radiology:							
Chest X-ray	2.601	2.534	.974	.043	.074	.191	.187
Knee X-ray	2.926	2.904	.992	.125	.118	.262	.267
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2.599	2.606	1.003	.036	.067	.219	.217
Electroencephalogram (EEG)	5.498	-	-	.028	-	.149	-
Pathology:							
Urinalysis	.497	.423	.851	.071	.106	.380	.409
Cholesterol Blood Test	.874	.691	.791	.054	.080	.506	.240
Fasting Blood Sugar (FBS)	.656	.578	.881	.064	.059	.342	.242
Complete Blood Count (CBC)	.788	.749	.951	.048	.043	.355	.385

these kinds of services are higher than average for both Blue Shield and Medicare.

In examining the mean CVs, surgical specialists are seen to have less consistency in individual physician pricing almost uniformly for all general medical services and visits. Paralleling the findings for all physicians, these specialists show less consistency in individual physician pricing under Medicare than under Blue Shield for nearly all general medical services and visits, with Medicare office visits appearing as particularly likely objects of price discrimination. The mean CVs for surgical procedures are very similar to those seen for all physicians, again reflecting the fact that nearly all surgery is done by surgical specialists. Arthrocentesis and proctosigmoidoscopy, the two surgical procedures commonly done by other kinds of physicians, show smaller mean CVs (and much more consistent pricing practice by individual physicians) than was found for the overall physician population. For diagnostic services, the consistency of individual surgical specialists' pricing practices relative to the consistency for all physicians is greatly mixed. Evidence of possible discriminatory behavior is most pronounced for X-rays of the knee (both programs) and for urinalysis under Medicare. Individual physician pricing consistency is extraordinarily tight for EEGs.

The CV of medians indicates, for nearly all procedures, a pattern of price agreement between different physicians that is very similar to that of the all physician population. There is good agreement on pricing for surgical procedures for all except arthrocentesis and proctosigmoidoscopy; and even these show better agreement than the average for all physicians. There is high agreement on pricing for EEG under Medicare; and there is

agreement on EKG and diagnostic radiology very similar to that for all physicians. Surgical specialists appear to be particularly diverse in their pricing practices for pathology services.

D. ANESTHESIOLOGY

Nearly all anesthesiology services are performed by physicians who identify themselves as anesthesiologists. Hence the comparative price characteristics shown in Table 2-7 for anesthesiology services performed by anesthesiologists are extremely close to the comparative pricing data for these services shown earlier for all doctors.

As noted previously, the episode-based data show significantly higher charges to Medicare than to Blue Shield for anesthesia services. The differences are much greater than those found in the RVU-based data, suggesting that the episode-based data are in large measure reflecting clinical differences arising from the more advanced age and generally less sound physical condition of Medicare patients. The mean CVs also are almost uniformly larger in the episode-based data than in the unit-based data, again suggesting clinical differences from one case to another in the episode-based results.

On an RVU basis, the Medicare/Blue Shield Price Ratios indicate average Blue Shield and Medicare prices to be very close for anesthesiology services related to most surgical procedures. The largest differences seen in the table are for lens excision, D & C, and hysterectomy anesthesia, where Medicare unit prices are higher by proportions ranging from 4.6 percent to 6.6 percent.

TABLE 2-7. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR SELECTED SERVICES PERFORMED BY ANESTHESIOLOGISTS

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	-	1.015	-	-	.148	-	.267
Intermediate Office Visit	-	1.175	-	-	.139	-	.270
Brief Hospital Visit	-	.952	-	-	.058	-	.313
Intermediate Hospital Visit	1.173	1.518	1.294	.064	.080	.229	.375
Comprehensive Consultation	-	4.826	-	-	.092	-	.135
Anesthesia (by Episode):							
for Ex. Breast Cyst	7.174	8.482	1.182	.150	.186	.236	.161
for Tonsillectomy (Child)	8.967	-	-	.101	-	.173	-
for Tonsillectomy (Adult)	9.221	-	-	.042	-	.159	-
for Appendectomy	11.913	-	-	.139	-	.164	-
for Cholecystectomy	15.243	15.680	1.029	.146	.171	.208	.202
for Herniorrhaphy	9.966	11.044	1.108	.049	.182	.217	.236
for TUR Prostate	11.194	12.247	1.094	.174	.173	.217	.181
for D&C	5.771	7.231	1.253	.159	.188	.185	.154
for Hysterectomy	16.208	-	-	.146	-	.183	-
for Laminotomy	18.581	-	-	.134	-	.181	-
for Lens Extraction	12.409	13.328	1.074	.164	.135	.328	.288
Anesthesia (by Unit of Service)							
for Ex. Breast Cyst	1.125	1.140	1.013	.077	.086	.145	.132
for Tonsillectomy (Child)	1.111	-	-	.063	-	.133	-
for Tonsillectomy (Adult)	1.113	-	-	.072	-	.132	-
for Appendectomy	1.117	-	-	.077	-	.120	-
for Cholecystectomy	1.108	1.116	1.007	.071	.094	.134	.131
for Herniorrhaphy	1.135	1.131	.996	.078	.097	.141	.144
for TUR Prostate	1.135	1.111	.979	.079	.088	.143	.131
for D&C	1.139	1.213	1.065	.091	.104	.162	.178
for Hysterectomy	1.128	1.203	1.066	.068	.070	.132	.092
for Laminotomy	1.136	-	-	.066	-	.128	-
for Lens Extraction	.966	1.010	1.046	.116	.095	.259	.226

The mean CV values for anesthesiology services under Blue Shield tend to be fairly uniform. Those for services reimbursed under Medicare appear to be only slightly less uniform, and for most procedures, just slightly larger. From other in-house studies at Pennsylvania Blue Shield, it is known that anesthesiologists' prices have been rising rather sharply over recent years. The mean CVs seen here therefore probably are more indicative of price change phenomena than of price discrimination, per se.

The CV of medians (unit basis) is relatively uniform and small over all anesthesiology procedures, indicating a high level of agreement between anesthesiologists on the prices of their basic services.

Anesthesiologists' visit prices are mixed, in relation to average visit prices for all doctors. The practice of anesthesiology in recent years has been tending toward a greater amount of direct contact between anesthesiologist physicians and patients, most of this occurring with inpatients in the hospital setting. For these visits in the hospital setting, the average anesthesiologist's price level for a brief hospital visit is very close to the average for all physicians; the Blue Shield intermediate hospital visit is 15.1 percent lower than the all doctor average; and the Medicare intermediate hospital visit is 11.9 percent higher. The intermediate hospital visit is on average priced 29.4 percent higher for Medicare than for Blue Shield, again probably reflecting additional time and precaution taken in connection with anesthesia for more elderly patients. The CV of medians, incidentally, indicates great variation (poor agreement) between different anesthesiologists in the pricing of intermediate hospital visits.

E. OTHER SPECIALTIES

Comparative pricing characteristics for physicians in other specialties are displayed in Table 2-8. "Other" specialists have price levels for visits and consultation that are higher than the all physician averages by margins ranging from 8.7 percent to 16.3 percent. Their average Medicare and Blue Shield prices differ, but not by much, and not in any consistent pattern. Mean CVs listed in the table suggest little, if any, price discrimination for these general medical services (visits and consultation), with the exception of Medicare office visits. While Medicare office visits have somewhat higher mean CV than seen for other types of visits and consultations listed here, they are not as high as the "all physician" mean CVs for Medicare office visits. The physicians in this cohort tend to have a rather extraordinarily poor level of agreement on pricing for both office visits and hospital visits (as indicated by high-valued CV of medians). Perhaps this is simply because "other," by definition, constitutes a diverse lot.

The price levels for diagnostic radiology are very close to the all physician averages, probably because this type of service tends to be dominated by radiologists (included among "other"). By contrast, pathology services have lower average prices among this cohort than among all physicians in aggregate. This may be reflecting a situation in which a significant volume of pathology services are performed by physicians in other cohorts (e.g., general practice or medical specialties), but pathologists -- by concentrating on these types of services -- achieve

TABLE 2-8. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR SELECTED SERVICES PERFORMED BY PHYSICIANS IN OTHER SPECIALTIES

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Medical Services and Visits:							
Brief Office Visit	-	1.117	-	-	.146	-	.341
Intermediate Office Visit	-	1.408	-	-	.093	-	.394
Home Visit	-	1.619	-	-	.085	-	.287
Initial Hospital Visit	4.762	4.836	1.016	.044	.076	.320	.234
Brief Hospital Visit	1.052	1.108	1.053	.081	.069	.373	.387
Intermediate Hospital Visit	1.586	1.538	.970	.071	.070	.418	.401
Comprehensive Consultation	5.309	5.157	.971	.066	.063	.246	.245
Surgical Procedures:							
Arthrocentesis	1.947	2.064	1.060	.103	.147	.349	.310
Proctosigmoidoscopy	-	2.517	-	-	.058	-	.247
Diagnostic Radiology:							
Chest X-ray	2.753	2.747	.998	.036	.049	.181	.173
Knee X-ray	2.545	2.529	.994	.082	.116	.233	.237
Upper GI	5.567	5.621	1.010	.036	.063	.180	.186
Barium Enema	4.918	4.926	1.002	.044	.063	.200	.206
Cholestography	3.934	3.893	.990	.038	.056	.171	.179
Diagnostic Medical Services:							
Electrocardiogram (EKG)	2.414	2.348	.973	.051	.054	.178	.210
Electroencephalogram (EEG)	5.727	5.286	.923	.063	.090	.250	.305
Pathology:							
Urinalysis	.385	.371	.964	.051	.087	.241	.318
Cholesterol Blood Test	.606	.620	1.023	.074	.091	.244	.246
Fasting Blood Sugar (FBS)	.546	.521	.954	.047	.091	.350	.246
Complete Blood Count (CBC)	.751	.703	.936	.046	.099	.258	.252

economies of scale in delivering them. Medicare and Blue Shield prices for diagnostic radiology appear to be quite close on average. Diagnostic medical services and pathology, on the other hand, appear to exhibit a slight price break for Medicare for most of these kinds of procedures in the "other" cohort.

Mean CVs for the diagnostic service categories tend to be quite small, especially for Blue Shield. The findings suggest little or no price discrimination for these services among physicians in other specialties in the Blue Shield market, and only slightly greater indication of possible discrimination in the Medicare market.

There is a relatively high level of price agreement for diagnostic radiology services performed by other specialists (presumably mainly radiologists for these types of services). The degree of price agreement between physicians in this cohort appears to be rather ordinary for most diagnostic medical and pathology services.

VI. FINDINGS BETWEEN SPECIALTY GROUPS

In this section, the data are rearranged and examined to highlight differences between specialty groups for three classes of procedures: (a) visits and consultation; (b) surgical procedures; and (c) ancillary and diagnostic services. Specialty groups are defined as before.

A. VISITS AND CONSULTATION

Table 2-9 displays physician pricing characteristics by specialty group for selected types of visits and consultation. Included are brief and intermediate office visits; initial, brief, and intermediate hospital visits; and comprehensive consultation. As in the preceding sections, Blue Shield and Medicare price levels are given in terms of Relative Price Units (RPUs), and the ratio of characteristic Medicare prices to Blue Shield prices is given. Mean CV and CV of medians are included, as before, to provide indicators of consistency of pricing behavior at the individual physician and physician cohort levels, respectively. In addition, the numbers of physicians represented in each specialty group cohort for each procedure are given.

The results in Table 2-9 show quite dramatically the differences in prices for specialists (of all types) and general practice physicians. These differences are even more pronounced for Medicare patients than for Blue Shield. Both types of office visit show generalists giving lower prices to Medicare, and specialists giving higher prices to Medicare.

TABLE 2-9. PRICING CHARACTERISTICS BY SPECIALTY GROUP FOR SELECTED KINDS OF PHYSICIAN VISITS AND CONSULTATION

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians		N	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare	Blue Shield	Medicare
Brief Office Visit:									
General/Family Practice	.940	.872	.928	.147	.054	.218	.177	178	3,222
Medical Specialties	1.053	1.090	1.035	.062	.160	.321	.276	54	1,619
Surgical Specialties	1.082	1.102	1.018	.058	.195	.271	.292	37	2,302
Anesthesiology	-	1.015	-	-	.148	-	.267	-	29
Other Specialties	-	1.117	-	-	.146	-	.341	-	246
Intermediate Office Visit:									
General/Family Practice	1.048	1.032	.985	.045	.110	.155	.232	115	2,344
Medical Specialties	1.354	1.356	1.001	.041	.103	.248	.288	79	1,737
Surgical Specialties	1.200	1.407	1.173	.045	.135	.253	.314	37	2,146
Anesthesiology	-	1.175	-	-	.139	-	.270	-	19
Other Specialties	-	1.408	-	-	.093	-	.394	-	216
Comprehensive Consultation:									
General/Family Practice	3.946	3.939	.998	.050	.058	.336	.312	103	127
Medical Specialties	5.223	5.245	1.004	.063	.065	.275	.274	1,032	1,032
Surgical Specialties	4.258	4.219	.991	.085	.094	.289	.291	904	904
Anesthesiology	-	-	-	-	-	-	-	-	-
Other Specialties	5.309	5.157	.971	.066	.063	.246	.245	134	134
Initial Hospital Visit:									
General/Family Practice	3.623	3.519	.971	.044	.053	.359	.262	1,128	1,288
Medical Specialties	4.669	4.777	1.023	.055	.060	.276	.275	1,590	1,422
Surgical Specialties	3.976	3.993	1.004	.066	.079	.281	.277	957	820
Other Specialties	4.762	4.836	1.016	.044	.076	.320	.234	102	115
Brief Hospital Visit:									
General/Family Practice	.853	.860	1.008	.068	.073	.336	.333	940	1,277
Medical Specialties	1.027	1.105	1.076	.071	.069	.365	.316	923	998
Surgical Specialties	.986	.978	.992	.084	.087	.375	.364	1,023	1,127
Anesthesiology	-	.952	-	-	.058	-	.313	-	16
Other Specialties	1.052	1.108	1.053	.081	.069	.373	.387	88	141
Intermediate Hospital Visit:									
General/Family Practice	1.227	1.196	.975	.075	.065	.357	.335	1,180	1,380
Medical Specialties	1.467	1.478	1.007	.081	.064	.328	.303	1,787	1,667
Surgical Specialties	1.384	1.344	.971	.096	.081	.352	.340	1,324	1,295
Anesthesiology	1.173	1.518	1.294	.064	.080	.229	.375	15	20
Other Specialties	1.586	1.538	.970	.071	.070	.418	.401	140	200

Price differences between general practice physicians and specialists range from 12.0 percent to 29.2 percent under Blue Shield, and range upward to differences as great as 36.3 percent (general practice compared to surgical or "other" specialists) under Medicare. For hospital visits, specialist prices commonly exceed generalist prices by 20 to 30 percent, or more.

The mean CV data suggest that general practice physicians may be price discriminating to Blue Shield patients for brief office visits, and to Medicare patients for intermediate office visits. There is little or no indication, however, to suggest generalist price discrimination for Medicare brief office visits or Blue Shield intermediate office visits. All cohorts of specialists show evidence of possible price discrimination for Medicare office visits, along with little or no price discrimination for Blue Shield office visits.

General practice physicians have reasonably good characteristic price agreement among themselves (CV of medians) for both types of office visit. Price level agreement between different specialists for office visits ranges from fair to poor.

All physician cohorts exhibit little, if any, evidence of price discrimination for hospital visits under either Medicare or Blue Shield. All physician cohorts also show almost universally low levels of agreement on prices for hospital visits.

Except for surgical specialties, there is little price discrimination evidenced for consultations; and even for surgical specialists, the mean CV for consultation is not outstandingly large. Specialists have uniformly reasonable levels of agreement between different physicians for

consultation prices; but general practice physicians have relatively high values for CV of medians (low level of inter-physician agreement) for consultation.

B. SURGICAL PROCEDURES

Table 2-10 shows comparative data between specialty groups, and between Blue Shield and Medicare, on pricing characteristics for selected surgical procedures. Most of the more significant and definitive surgical procedures are performed almost solely by surgical specialists, and hence are not included among the selected procedures in this table, since there are no useful or interesting inter-specialty comparisons to be made for them. Arthrocentesis and proctosigmoidoscopy, although minor in nature and performed predominately in the office setting, are included because they are performed very frequently, both by generalists and a great variety of specialists. Tonsillectomy (child) is included here because it was the only definitive, therapeutic surgical procedure (from among the procedures addressed in this study) for which there was statistically meaningful incidence in any physician cohort other than surgical specialists. Vaginal obstetrical delivery also is included in this group for present purposes.

For arthrocentesis, the difference between the lowest priced cohort (medical specialties) and the highest (surgical specialties) is 10.6 percent under Medicare and 13.7 percent under Blue Shield. General/family practice physicians, surprisingly, are not the lowest priced for this

TABLE 2-10. PRICING CHARACTERISTICS BY SPECIALTY GROUP FOR SELECTED SURGICAL PROCEDURES

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians		N	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare	Blue Shield	Medicare
Arthrocentesis:									
General/Family Practice	1.969	1.864	.947	.096	.130	.323	.333	460	258
Medical Specialties	1.903	1.867	.981	.088	.137	.313	.305	169	186
Surgical Specialties	2.163	2.064	.954	.137	.166	.337	.336	378	306
Other Specialties	1.947	2.064	1.060	.103	.147	.349	.310	27	27
Tonsillectomy (Child):									
General/Family Practice	11.294	-	-	.076	-	.124	-	10	-
Surgical Specialties	15.526	-	-	.058	-	.240	-	178	-
Proctosigmoidoscopy:									
General/Family Practice	2.427	2.330	.960	.057	.067	.339	.348	144	62
Medical Specialties	2.711	2.743	1.012	.056	.070	.283	.293	290	25
Surgical Specialties	3.353	3.306	.986	.085	.124	.302	.308	468	44
Vaginal Delivery:									
General/Family Practice	26.023	-	-	.053	-	.210	-	98	-
Surgical Specialties	39.667	-	-	.054	-	.182	-	585	-

procedure. Overall, the price range for this procedure is relatively narrow. The average generalist physician gives Medicare a 5.3 percent price break, while the average physician in "other" specialties charges 6.0 percent more to Medicare than to Blue Shield patients.

The price difference between specialty groups is much more significant for proctosigmoidoscopy. Here, surgical specialties again are highest, with price levels under both Medicare and Blue Shield that are approximately 40 percent higher than those of the lowest priced cohort (generalists). Differences between Medicare and Blue Shield prices for this procedure are very slight.

Relatively high mean CV values for arthrocentesis very strongly suggest the possibility of some price discrimination at the individual physician level in all cohorts, especially under Medicare. Except for surgical specialists, there is relatively much less indication of individual physician price discrimination for proctosigmoidoscopy. For surgical specialists under Medicare, the indication of possible discrimination is quite high for this procedure. In general, both arthrocentesis and proctosigmoidoscopy show very poor price agreement between different physicians (high CV of medians) in all cohorts.

The average general practice physician's price for a child's tonsillectomy is 27.3 percent less than that of the average surgical specialist. For vaginal obstetrical delivery, the average generalist's price is 34.4 percent less than the average for surgical specialists. Both generalists and surgical specialists show little, if any, price discrimination for either of these procedures. Physicians in both cohorts show relatively high levels of agreement on prices for both procedures.

C. MISCELLANEOUS/DIAGNOSTIC PROCEDURES

Pricing characteristics by specialty group for selected miscellaneous and diagnostic procedures are shown in Table 2-11. This includes the diagnostic radiology procedures, EKG, and pathology (lab test) procedures.

"Other" specialties have the highest prices for nearly all diagnostic radiology -- "other" in this instance almost certainly being represented by radiologists in the "other" cohort. The price differentials are not particularly large, however. As the single exception, both in direction and in magnitude of difference, the results for knee x-ray show surgical specialists' prices (presumably orthopedic surgeons who take their own x-rays) to be approximately 15 percent higher than "other" specialists' prices under both Medicare and Blue Shield. Diagnostic radiology in general shows very little price difference between Medicare and Blue Shield in any of the specialty cohorts. Diagnostic radiology (except for knee x-ray) in general shows little evidence of individual physician price discrimination, while also showing relatively high levels of price agreement between different physicians, in all specialty groups. There appear to be no remarkable differences between specialty groups with regard to consistency of pricing practices, either at the individual physician level or the cohort level, for diagnostic radiology services.

For EKGs, general/family practice physicians have the lowest price levels, and surgical specialists the highest. Average surgical specialist prices for EKG are 12.3 percent higher than average generalist prices under Blue Shield, and 15.0 percent higher under Medicare. There is very

TABLE 2-11. PRICING CHARACTERISTICS BY SPECIALTY GROUP FOR SELECTED MISCELLANEOUS/DIAGNOSTIC PROCEDURES

Procedure	Relative Price Units		Medicare/BS	Mean CV		CV of Medians		N	
	Blue Shield	Medicare	Price Ratio	Blue Shield	Medicare	Blue Shield	Medicare	Blue Shield	Medicare
Chest X-Ray:									
General/Family Practice	2.606	2.667	1.023	.053	.058	.191	.187	31	32
Medical Specialties	2.623	2.627	1.002	.041	.051	.156	.151	189	187
Surgical Specialties	2.601	2.534	.974	.043	.074	.191	.187	12	13
Other Specialties	2.753	2.747	.998	.036	.049	.181	.173	191	156
Knee X-Ray:									
Medical Specialties	2.395	-	-	.090	-	.235	-	11	-
Surgical Specialties	2.926	2.904	.992	.125	.118	.262	.267	95	44
Other Specialties	2.545	2.529	.994	.082	.116	.233	.237	133	77
Upper GI:									
General/Family Practice	5.132	5.097	.993	.035	.059	.200	.212	32	23
Other Specialties	5.567	5.621	1.010	.036	.063	.180	.186	155	128
Barium Enema:									
Medical Specialties	4.767	4.564	.957	.021	.034	.200	.178	17	16
Other Specialties	4.918	4.926	1.002	.044	.063	.200	.206	93	91
Cholecystography:									
Medical Specialties	3.769	3.589	.952	.040	.036	.180	.165	31	15
Other Specialties	3.934	3.893	.990	.038	.056	.171	.179	131	86
EKG:									
General/Family Practice	2.315	2.266	.979	.036	.061	.229	.231	1,007	833
Medical Specialties	2.364	2.338	.989	.038	.060	.195	.195	1,363	1,363
Surgical Specialties	2.599	2.606	1.003	.036	.067	.219	.217	67	67
Other Specialties	2.414	2.348	.973	.051	.054	.178	.210	55	55

TABLE 2-11. (CONTINUED -- Page 2 of 2)

Procedure	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians		N	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare	Blue Shield	Medicare
Urinalysis:									
General/Family Practice	.425	.347	.816	.059	.115	.329	.363	237	738
Medical Specialties	.423	.383	.905	.052	.086	.341	.363	361	731
Surgical Specialties	.497	.423	.851	.071	.106	.380	.409	69	196
Other Specialties	.385	.371	.964	.051	.087	.241	.318	37	144
Cholesterol Blood Test:									
General/Family Practice	.677	.655	.968	.058	.064	.276	.267	201	263
Medical Specialties	.655	.638	.974	.053	.050	.336	.334	305	341
Surgical Specialties	.874	.691	.791	.054	.080	.506	.240	16	15
Other Specialties	.606	.620	1.023	.074	.091	.244	.246	28	92
FBS:									
General/Family Practice	.565	.515	.912	.047	.074	.245	.262	478	1,039
Medical Specialties	.553	.529	.957	.050	.062	.238	.242	487	803
Surgical Specialties	.656	.578	.881	.064	.059	.342	.242	26	69
Other Specialties	.546	.521	.954	.047	.091	.350	.246	45	178
CBC:									
General/Family Practice	.756	.710	.939	.057	.082	.241	.250	411	569
Medical Specialties	.737	.708	.961	.056	.069	.285	.290	505	628
Surgical Specialties	.788	.749	.951	.048	.043	.355	.385	43	39
Other Specialties	.751	.703	.936	.046	.099	.258	.252	49	154

little difference between average Blue Shield and Medicare prices. EKGs are performed primarily by general practice and medical specialist physicians, and the mean CV under Blue Shield for both of these groups is extremely low. The mean CVs for Medicare, while not particularly large in absolute terms, are more than 50 percent greater than the Blue Shield mean CVs -- possibly indicating more individual physician price discrimination with Medicare patients than with Blue Shield patients for physicians in both of these cohorts, as well as for surgical specialists. Physicians in all cohorts show good levels of price agreement for EKG.

For pathology procedures, physicians in surgical specialties consistently have the highest prices. "Other" specialists (presumably represented here primarily by pathologists) consistently tend to have the lowest, or near lowest, prices. The percentage difference between highest and lowest price levels, by specialty cohort, is quite large for most specific procedures. All specialty groups tend to give a large price break to Medicare for pathology services. The relative ranking of different specialty groups with respect to Medicare/Blue Shield price ratio varies, however, from procedure to procedure; and no uniform pattern is apparent on this between specialty groups.

There is no clear, consistent pattern of difference between specialty cohorts with respect to pricing consistency at the individual physician level (mean CV) for pathology services. As the most noticeable exception, general practice and surgical specialist physicians may be showing relatively more price discrimination for urinalyses for Medicare patients.

The patterns of price agreement between different physicians in given cohorts (CV of medians) vary from procedure to procedure. All specialty

groups show poor agreement on price levels for urinalysis, with surgical specialists showing the least agreement. For cholesterol blood test and FBS, the agreement levels within most cohorts are more-or-less average -- with the exceptions that surgical specialists again have an unusually large CV of medians (low agreement) for these two tests under Blue Shield, and medical specialists have a low agreement level for cholesterol blood test under both Blue Shield and Medicare. Surgical specialists once again are shown as having unusually diverse pricing practices between different physicians for CBC.

VII. FINDINGS BETWEEN MARKET AREAS

This section examines inter-area differences in physician prices and pricing characteristics for Standard Metropolitan Statistical Areas (SMSAs) in Pennsylvania. The Pennsylvania portion of the Philadelphia SMSA here has been split into two parts: the first consisting of central city Philadelphia (Philadelphia County), and the second consisting of the aggregation of Philadelphia's four suburban counties. Similarly, Beaver County has been segregated from the rest of what usually is treated as the Pittsburgh SMSA. All counties not associated with SMSAs are aggregated as non-SMSA, or rural. The fifteen areas defined in this manner (including the rural residual as a single area) constitute fifteen separate and distinct medical market areas for purposes of this study task.

There is considerable price variation from procedure to procedure -- variation that frequently is irregular, and sometimes seemingly anamolous and capricious. This then is compounded by overlaying it on geographic inter-area variations that often appear equally irregular and capricious. Systematic patterns and generalizations are quite hard to discern in a treatment of inter-area comparisons based upon concurrent examination of several different specific individual procedures. The following therefore will be limited essentially to descriptive detail, with only loosely drawn generalizations. A more orderly and useful analysis requires single-valued composite price indexes, along with more powerful statistical tools and multivariate analytic techniques. These extensions are addressed in other parts of this Final Report.

A. VISITS AND CONSULTATION

Inter-area differences for general medical services are examined here through the vehicle of three repesentative specific procedures: brief office visit, intermediate hospital visit, and comprehensive consultation. Comparative price characteristic data for these procedures are displayed in Tables 2-12, 2-13 and 2-14, respectively. The format is the same as used for several previous displays: price levels, expressed in terms of relative price units (RPUs); Medicare and Blue Shield price levels compared by means of the Medicare/Blue Shield price ratio; and mean CV and CV of medians, each for both Medicare and Blue Shield. Data are displayed for each of the fifteen areas, with statewide averages also included as reference points. To facilitate a more ready comparison of the relative price levels between areas, the RPU data also have been converted to multiples of the statewide average price for each topic procedure listed. These cross-sectional price relatives are given in Table 2-15, for each of the three procedures and each line of business.

The RPU data in Tables 2-12 through 2-14, together with the geographic cross-sectional price relatives in Table 2-15, indicate that Philadelphia and its suburban areas have consistently high prices for these general visit and consultation services. Philadelphia and its suburbs in fact emerge as the highest priced areas in the state. There is no consistent pattern on the lowest price areas. However, those areas tending generally to be low priced include the rural areas, Altoona (which is chronically depressed economically), and some small cities in the central and southcentral part of the state (where there tend to be

TABLE 2-12. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR BRIEF OFFICE VISIT, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	.984	1.000	1.016	.055	.165	.239	.292
Pittsburgh	1.048	1.056	1.008	.064	.171	.227	.262
Philadelphia	1.034	1.111	1.074	.039	.146	.275	.307
Suburban Philadelphia	1.014	1.055	1.040	.053	.163	.233	.276
Allentown-Bethlehem-Easton	.916	.963	1.051	.059	.178	.250	.289
Altoona	-	.929	-	-	.180	-	.270
Erie	.945	.987	1.044	.050	.184	.126	.234
Harrisburg	.840	.952	1.133	.030	.185	.180	.291
Johnstown	-	.966	-	-	.168	-	.313
Lancaster	-	.833	-	-	.157	-	.249
Wilkes Barre-Scranton	1.070	1.021	.954	.067	.157	.259	.274
Beaver	.956	.961	1.005	.055	.172	.214	.250
Reading	1.011	.953	.943	.081	.164	.210	.240
Williamsport	-	.926	-	-	.181	-	.250
York	.987	.876	.888	.098	.168	.212	.265
Non-SMSA Areas	.876	.864	.986	.044	.172	.175	.249

TABLE 2-13. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR INTERMEDIATE HOSPITAL VISIT, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	1.381	1.357	.983	.084	.069	.354	.341
Pittsburgh	1.282	1.281	.999	.083	.062	.322	.307
Philadelphia	1.640	1.599	.975	.089	.070	.325	.312
Suburban Philadelphia	1.478	1.462	.089	.083	.071	.350	.331
Allentown-Bethlehem-Easton	1.317	1.282	.973	.088	.066	.311	.295
Altoona	1.061	1.143	1.077	.100	.066	.256	.336
Erie	1.258	1.206	.959	.088	.068	.265	.266
Harrisburg	1.318	1.277	.969	.086	.060	.389	.370
Johnstown	1.401	1.440	1.028	.056	.060	.370	.370
Lancaster	1.194	1.131	.947	.092	.084	.287	.250
Wilkes Barre-Scranton	1.324	1.301	.983	.072	.068	.330	.328
Beaver	1.189	1.162	.977	.089	.064	.321	.317
Reading	1.173	1.148	.979	.086	.054	.256	.248
Williamsport	1.126	1.172	1.041	.056	.067	.346	.380
York	1.284	1.234	.961	.071	.080	.250	.244
Non-SMSA Areas	1.208	1.182	.978	.083	.076	.339	.333

TABLE 2-14. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR COMPREHENSIVE CONSULTATION, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	4.767	4.737	.994	.071	.077	.300	.302
Pittsburgh	4.206	4.190	.996	.068	.076	.278	.273
Philadelphia	5.561	5.497	.988	.080	.084	.283	.293
Suburban Philadelphia	4.929	4.940	1.002	.068	.080	.282	.277
Allentown-Bethlehem-Easton	5.108	5.110	1.000	.062	.065	.224	.223
Altoona	3.385	3.767	1.113	.059	.061	.116	.308
Erie	4.514	4.575	1.014	.060	.080	.228	.224
Harrisburg	4.370	4.392	1.005	.081	.076	.264	.230
Johnstown	4.686	4.623	.987	.029	.029	.259	.250
Lancaster	3.874	3.683	.951	.059	.070	.185	.194
Wilkes Barre-Scranton	4.851	4.874	1.005	.076	.074	.293	.305
Beaver	4.258	4.307	1.012	.057	.061	.234	.223
Reading	4.168	4.324	1.037	.077	.082	.264	.230
Williamsport	4.126	4.099	.993	.050	.067	.250	.256
York	4.452	4.658	1.046	.076	.092	.234	.237
Non-SMSA Areas	4.120	4.000	.971	.078	.076	.276	.285

TABLE 2-15. RATIOS OF METROPOLITAN AREA AVERAGE PRICE LEVELS FOR SELECTED VISITS AND CONSULTATION, RELATIVE TO STATEWIDE AVERAGE PRICES

Area (SMSA)	Blue Shield				Medicare			
	Brief Off. Vis.	Intermed. Hosp. Vis.	Comp. Consult.	Mean	Brief Off. Vis.	Intermed. Hosp. Vis.	Comp. Consult.	Mean
Pittsburgh	1.065	.928	.882	.958	1.056	.943	.885	.961
Philadelphia	1.051	1.187	1.167	1.135	1.111	1.178	1.161	1.150
Phila. Suburban	1.030	1.070	1.034	1.045	1.055	1.077	1.043	1.058
Allentown-Bethlehem-Easton	.931	.954	1.071	.985	.963	.944	1.079	.995
Altoona	-	.768	.710	.739	.929	.842	.795	.855
Erie	.960	.910	.947	.939	.987	.889	.966	.947
Harrisburg	.853	.954	.917	.908	.952	.941	.927	.940
Johnstown	-	1.014	.983	.999	.966	1.061	.976	1.001
Lancaster	-	.864	.813	.839	.833	.833	.778	.815
Wilkes Barre-Scranton	1.087	.959	1.018	1.021	1.021	.959	1.029	1.003
Beaver	.972	.861	.893	.909	.961	.856	.909	.909
Reading	1.028	.849	.874	.917	.953	.846	.913	.904
Williamsport	-	.815	.865	.840	.926	.863	.865	.885
York	1.003	.930	.934	.956	.876	.909	.983	.923
Non-SMSA	.889	.875	.864	.876	.864	.871	.844	.860

relatively strong rurally oriented value systems). There are no strong consistent inter-area patterns of Medicare/Blue Shield price differences. The non-SMSA areas consistently give a better than average price break to Medicare patients, but do not consistently give the best price break, compared to other areas.

The mean CVs are relatively close across most areas. They are rather unusually small for brief office visits in Harrisburg and Philadelphia under Blue Shield; are comparatively small for Blue Shield intermediate hospital visits in Willamsport; are very small for consultations in Johnstown under both Medicare and Blue Shield; and are large for Medicare brief office visits everywhere, but are especially large in Erie and Williamsport. All of this adds up to no generalizable pattern. The values listed for CV of medians similarly defy any attempt at systematic and consistent inter-area generalizations.

B. SURGICAL PROCEDURES

Since experience in surgical procedures is relatively rich in the Blue Shield component of the data base, while being relatively sparse in the Medicare component, inter-area comparison of price characteristics for surgical services will be made here with primary emphasis on Blue Shield data. The data for this are presented in Tables 2-16, 2-17, 2-18 and 2-19. In Table 2-16, RPU data are displayed for 13 representative surgical procedures, plus vaginal obstetrical delivery (which is included with the surgical procedures as a matter of convenience), for each of the 15 areas. Table 2-17 displays the same data transformed to cross-

sectional price relatives (multiples of the statewide average price) for each procedure and area, plus the mean price relative for each area across all procedures listed for an area. Tables 2-18 and 2-19, respectively, display the corresponding mean CV and CV of medians data. For economy of space layout in Tables 2-16 through 2-19, the surgical procedures are indicated by numerical codes. The key to the surgical procedure codes for Tables 2-16 through 2-19 is given in Table 2-20 (page 91).

Tables 2-16 and 2-17 show central Philadelphia to be the most consistently high priced area for surgical procedures, with suburban Philadelphia also consistently relatively high. The surgical procedures referenced here have prices that average about 10.7 percent higher for central Philadelphia physicians than for the average physician statewide. The Erie SMSA also ranks among the state's highest, with the average Erie area physician being 7.6 percent higher than the statewide average for these sample procedures. Johnstown similarly is higher than average. Pittsburgh, although a major metropolitan area, has average surgical prices that are slightly below the statewide average. The lowest priced areas for surgery are Lancaster, Williamsport, York, and the rural areas. All of the other areas have mixed patterns.

The mean CV data in Table 2-18 do not present a very clear picture with respect to consistency of pricing and implications for possible price discrimination at the individual physician level. Johnstown has consistently low mean CV values, and Philadelphia (both center city and suburbs) tends to have fairly consistently high mean CV values; but beyond that, the pattern is quite mixed.

TABLE 2-16. RELATIVE PRICE UNITS FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD, BY METROPOLITAN AREA

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)						
	01	02	03	04	05	06	07
Statewide	15.699	2.029	16.564	15.334	31.180	3.000	49.257
Pittsburgh	14.755	1.956	15.082	16.160	30.590	2.916	50.112
Philadelphia	17.262	2.044	18.206	17.006	34.409	3.257	55.937
Philadelphia Suburban	16.055	2.070	16.052	16.192	34.239	2.948	51.167
Allentown-Bethlehem-Easton	18.643	2.014	20.364	15.069	30.897	2.566	48.467
Altoona	--	--	--	--	--	2.649	--
Erie	--	2.148	--	--	--	3.385	--
Harrisburg	15.145	2.024	17.623	16.918	30.662	2.942	49.351
Johnstown	16.101	2.405	--	--	36.235	4.057	51.955
Lancaster	--	--	--	--	--	2.600	--
Wilkes Barre-Scranton	16.627	1.954	14.796	15.679	31.844	3.204	49.033
Beaver	15.573	2.368	17.627	15.292	28.245	2.982	48.123
Reading	--	1.795	--	--	35.415	3.079	--
Williamsport	--	2.057	--	--	--	2.816	--
York	13.841	1.718	--	--	--	2.832	48.103
Non-SMSA	13.449	2.097	15.380	13.534	27.655	2.921	46.187

TABLE 2-16. RELATIVE PRICE UNITS FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD, BY METROPOLITAN AREA (CONTINUED)

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)						
	08	09	10	11	12	13	14
Statewide	31.299	61.671	15.042	56.223	77.459	60.458	37.681
Pittsburgh	30.228	56.102	14.448	55.778	74.940	62.816	36.929
Philadelphia	34.643	66.486	17.796	64.557	89.729	58.911	45.400
Philadelphia Suburban	32.636	65.722	15.286	56.731	83.419	68.468	40.758
Allentown-Bethlehem-Easton	30.707	--	15.646	57.847	78.137	57.519	39.863
Altoona	--	--	--	--	--	--	36.983
Erie	--	--	--	58.911	--	--	40.297
Harrisburg	30.857	--	14.277	54.290	--	--	37.860
Johnstown	34.084	--	11.291	46.228	--	--	30.928
Lancaster	--	--	--	--	--	--	32.773
Wilkes Barre-Scranton	33.488	--	15.376	56.320	--	59.183	37.262
Beaver	28.060	--	13.223	51.424	--	--	32.990
Reading	36.369	57.751	15.034	57.065	--	--	36.970
Williamsport	--	--	--	--	--	--	27.819
York	28.780	--	13.245	56.320	--	--	33.183
Non-SMSA	27.782	59.107	12.915	51.593	--	60.798	29.391

TABLE 2-17. RATIOS OF AVERAGE PRICES BY METROPOLITAN AREA, RELATIVE TO STATEWIDE AVERAGE PRICES, FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)						
	01	02	03	04	05	06	07
Pittsburgh	.940	.964	.911	1.054	.981	.972	1.017
Philadelphia	1.100	1.007	1.099	1.109	1.104	1.086	1.136
Philadelphia Suburban	1.023	1.020	.969	1.056	1.098	.983	1.039
Allentown-Bethlehem-Easton	1.115	.993	1.229	.983	.991	.855	.984
Altoona	--	--	--	--	--	.883	--
Erie	--	1.059	--	--	--	1.128	--
Harrisburg	.965	.828	1.064	1.103	.983	.981	1.002
Johnstown	1.026	1.186	--	--	1.162	1.352	1.055
Lancaster	--	--	--	--	--	.867	--
Wilkes Barre-Scranton	1.059	.963	.893	1.022	1.021	1.068	.995
Beaver	.992	1.167	1.064	.997	.906	.994	.916
Reading	--	.885	--	--	1.136	.988	--
Williamsport	--	1.014	--	--	--	.939	--
York	.882	.847	--	--	--	.952	.916
Non-SMSA	.857	1.034	.929	.883	.887	.934	.938

TABLE 2-17. RATIOS OF AVERAGE PRICES BY METROPOLITAN AREA, RELATIVE TO STATEWIDE AVERAGE PRICES, FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD (CONTINUED)

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)							
	08	09	10	11	12	13	14	MEAN
Pittsburgh	.966	.910	.960	.992	.967	1.039	.980	.975
Philadelphia	1.107	1.078	1.183	1.148	1.158	.974	1.205	1.107
Philadelphia Suburban	1.043	1.066	1.016	1.009	1.077	1.132	1.082	1.044
Allentown-Bethlehem-Easton	.981	--	1.040	1.029	1.009	.951	1.058	1.017
Altoona	--	--	--	--	--	--	.981	.932
Erie	--	--	--	1.048	--	--	1.069	1.076
Harrisburg	.986	--	.949	.966	--	--	1.005	.985
Johnstown	1.089	--	.751	.822	--	--	.821	1.029
Lancaster	--	--	--	--	--	--	.870	.869
Wilkes Barre-Scranton	1.070	--	1.022	1.002	--	.979	.989	1.007
Beaver	.897	--	.879	.915	--	--	.876	.957
Reading	1.162	.936	.999	1.015	--	--	.981	1.013
Williamsport	--	--	--	--	--	--	.738	.897
York	.920	--	.881	1.002	--	--	.881	.910
Non-SMSA	.888	.958	.857	.918	--	1.006	.780	.913

TABLE 2-18. MEAN CV FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD, BY METROPOLITAN AREA

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)													
	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Statewide	.150	.110	.189	.059	.066	.072	.048	.065	.063	.134	.052	.072	.039	.054
Pittsburgh	.133	.113	.199	.040	.071	.074	.043	.064	.049	.133	.065	.053	.043	.056
Philadelphia	.164	.095	.211	.056	.069	.075	.059	.072	.069	.156	.063	.069	.091	.062
Philadelphia Suburban	.177	.109	.231	.074	.081	.065	.051	.083	.071	.154	.040	.089	.046	.050
Allentwn-Bethlehem-Easton	.120	.094	.131	.078	.052	.065	.050	.057	--	.086	.040	.083	.035	.042
Altoona	--	--	--	--	--	.107	--	--	--	--	--	--	--	.041
Erie	--	.148	--	--	--	.070	--	--	--	--	.020	--	--	.065
Harrisburg	.165	.123	.145	.105	.064	.080	.048	.081	--	.113	.063	--	--	.066
Johnstown	.140	.072	--	--	.008	.045	.024	.040	--	.067	.039	--	--	.020
Lancaster	--	--	--	--	--	.046	--	--	--	--	--	--	--	.073
Wilkes Barre-Scranton	.156	.128	.219	.035	.055	.069	.048	.060	--	.125	.056	--	.038	.056
Beaver	.136	.118	.177	.070	.078	.068	.051	.044	.065	.152	.039	--	--	.044
Reading	--	.078	--	--	.061	.079	--	.052	--	.100	.040	--	--	.036
Williamsport	--	.154	--	--	--	.083	--	--	--	--	--	--	--	.021
York	.080	.140	--	--	--	.060	.039	.051	--	.103	.022	--	--	.070
Non-SMSA	.155	.123	.128	.047	.065	.079	.048	.063	.075	.130	.057	--	.029	.053

TABLE 2-19. CV OF MEDIANS FOR SELECTED SURGICAL PROCEDURES UNDER BLUE SHIELD, BY METROPOLITAN AREA

Area (SMSA)	Procedure (See Table 2-20 for key to Procedure Numbers.)													
	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Statewide	.262	.333	.259	.243	.190	.329	.152	.185	.140	.255	.171	.192	.145	.224
Pittsburgh	.240	.337	.222	.231	.162	.313	.135	.193	.100	.235	.143	.173	.108	.175
Philadelphia	.285	.323	.220	.186	.218	.334	.148	.190	.148	.234	.184	.199	.134	.157
Philadelphia Suburban	.267	.307	.230	.274	.170	.332	.153	.179	.113	.244	.123	.114	.135	.135
Allentwn-Bethlehem-Easton	.221	.323	.340	.221	.165	.250	.148	.146	--	.166	.164	.154	.176	.211
Altoona	--	--	--	--	--	.198	--	--	--	--	--	--	--	.264
Erie	--	.303	--	--	--	.411	--	--	--	--	.047	--	--	.159
Harrisburg	.131	.281	.244	.281	.138	.340	.093	.127	--	.192	.129	--	--	.147
Johnstown	--	.300	--	--	.194	.222	.125	.139	--	.151	.116	--	--	.150
Lancaster	--	--	--	--	--	.249	--	--	--	--	--	--	--	.132
Wilkes Barre-Scranton	.173	.351	.146	.275	.192	.303	.171	.182	--	.164	.097	--	.168	.207
Beaver	.226	.325	.299	.214	.094	.314	.150	.120	--	.264	.120	--	--	.195
Reading	--	.299	--	--	.176	.264	--	.139	.167	.118	.149	--	--	.139
Williamsport	--	.378	--	--	--	.438	--	--	--	--	--	--	--	.078
York	.305	.401	--	--	--	.290	.074	.133	--	.198	.119	--	--	.195
Non-SMSA	.261	.341	.272	.211	.167	.338	.133	.168	.123	.274	.191	--	.112	.226

TABLE 2-20. KEY TO PROCEDURE NUMBERS FOR TABLES 2-16, 2-17, 2-18 and 2-19

Key Code	Procedure Terminology
01	Excision of breast cyst, unilateral
02	Arthrocentesis, major joint
03	Colles fracture, closed manipulative reduction
04	Tonsillectomy, child
05	Appendectomy
06	Proctosigmoidoscopy
07	Cholecystectomy
08	Herniorrhaphy, inguinal, unilateral
09	Transurethral resection (TUR) prostate
10	Dilation and curettage (D&C)
11	Hysterectomy, total, abdominal
12	Laminotomy for herniated intervertebral disc, unilateral, lumbar
13	Excision of lens, unilateral, for cateract, dislocated lens, etc.
14	Obstetrical delivery, vaginal, including antepartum and postpartum care

The data for CV of medians in Table 2-19 are similarly mixed. Harrisburg exhibits consistently low values (high agreement between physicians) relative to statewide averages; but after that, there is little or no consistent pattern.

C. ANCILLARY/DIAGNOSTIC PROCEDURES

Miscellaneous diagnostic services are represented here by five specific procedures: chest x-ray, upper GI, EKG, urinalysis, and FBS. Comparative pricing characteristic data for these five procedures are displayed, respectively, in Tables 2-21 through 2-25.

Across all of these procedures, the Philadelphia area (including suburban) once again exhibits consistently high relative price levels. York and Allentown-Bethlehem-Easton areas are consistently low. Again, the rural areas are never the highest, but also are not consistently lowest. After this, the relative price levels by procedure and area tend to be quite mixed. Price breaks for Medicare appear to be driven more by differences between procedures (or types of service) than by differences between areas.

Consistency of individual physicians' pricing practices (as indicated by small mean CV) is quite tight for diagnostic radiology services in Erie, Reading, Wilkes Barre-Scranton (Blue Shield only), and the Allentown-Bethlehem-Easton area. The mean CV for diagnostic radiology is a bit larger than average in the Harrisburg area, compared to other SMSAs; but, on the whole, mean CV does not appear to be particularly high anywhere in the state. EKGs have small mean CVs in Williamsport, and

TABLE 2-21. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR CHEST X-RAY, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	2.679	2.678	1.000	.039	.051	.172	.167
Pittsburgh	2.617	2.630	1.005	.047	.059	.159	.161
Philadelphia	2.883	2.868	.995	.045	.047	.143	.135
Suburban Philadelphia	2.788	2.701	.969	.039	.046	.180	.182
Allentown-Bethlehem-Easton	2.331	2.322	.996	.021	.029	.072	.065
Erie	2.386	2.336	.979	.025	.055	.094	.068
Harrisburg	2.535	2.556	1.008	.068	.088	.173	.065
Johnstown	2.986	-	-	.014	-	.076	-
Wilkes Barre-Scranton	2.513	2.474	.984	.023	.044	.108	.133
Beaver	2.649	2.896	1.093	.053	.058	.288	.244
Reading	2.916	2.928	1.004	.012	.027	.137	.118
Non-SMSA Areas	2.494	2.458	.986	.029	.045	.184	.158

TABLE 2-22. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR UPPER GI, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	5.487	5.540	1.010	.036	.061	.184	.190
Pittsburgh	5.151	5.143	.998	.034	.069	.176	.178
Philadelphia	5.915	6.112	1.033	.047	.052	.195	.201
Suburban Philadelphia	5.778	5.914	1.024	.047	.083	.181	.173
Allentown-Bethlehem Easton	4.881	4.913	1.007	.018	.048	.060	.064
Erie	5.236	5.236	1.000	.033	.018	.075	.075
Harrisburg	6.163	6.121	.993	.036	.063	.072	.069
Wilkes Barre-Scranton	4.804	4.828	1.005	.016	.056	.138	.187
Beaver	5.155	5.250	1.018	.015	.034	.091	.082
Non-SMSA Areas	5.038	4.936	.980	.036	.067	.142	.114

TABLE 2-23. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR EKG, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	2.353	2.321	.986	.037	.060	.210	.210
Pittsburgh	2.221	2.196	.989	.033	.058	.182	.184
Philadelphia	2.498	2.455	.983	.034	.051	.198	.203
Suburban Philadelphia	2.457	2.434	.991	.038	.061	.202	.205
Allentown-Bethlehem-Easton	2.247	2.165	.964	.035	.071	.179	.174
Altoona	2.345	2.325	.991	.020	.077	.171	.169
Erie	2.275	2.100	.923	.057	.067	.188	.131
Harrisburg	2.236	2.214	.990	.028	.056	.226	.205
Johnstown	2.820	2.780	.986	.032	.078	.255	.259
Lancaster	2.085	2.011	.965	.046	.048	.161	.169
Wilkes Barre-Scranton	2.253	2.192	.973	.047	.071	.208	.195
Beaver	2.262	2.195	.970	.035	.056	.187	.184
Reading	2.281	2.222	.974	.040	.085	.194	.204
Williamsport	2.062	2.031	.985	.025	.024	.136	.147
York	2.010	1.895	.943	.041	.050	.225	.163
Non-SMSA Areas	2.205	2.189	.993	.047	.075	.217	.216

TABLE 2-24. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR URINALYSIS, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	.428	.372	.869	.056	.100	.342	.363
Pittsburgh	.417	.359	.861	.051	.100	.302	.339
Philadelphia	.457	.404	.884	.061	.090	.371	.374
Suburban Philadelphia	.432	.393	.910	.053	.101	.324	.356
Allentown-Bethlehem-Easton	.442	.378	.855	.043	.104	.254	.324
Altoona	-	.344	-	-	.097	-	.253
Erie	.425	.377	.887	.087	.122	.313	.347
Harrisburg	.416	.330	.793	.051	.133	.339	.313
Johnstown	.381	.340	.892	.018	.092	.156	.313
Lancaster	-	.290	-	-	.113	-	.352
Wilkes Barre-Scranton	.444	.338	.761	.076	.115	.258	.302
Beaver	.401	.329	.820	.038	.105	.220	.314
Reading	.443	.344	.777	.035	.082	.214	.310
Williamsport	-	.372	-	-	.087	-	.320
York	.267	.293	1.097	.060	.119	.223	.316
Non-SMSA Areas	.351	.317	.903	.065	.104	.369	.332

TABLE 2-25. COMPARATIVE CHARACTERISTICS OF BLUE SHIELD AND MEDICARE PRICES FOR FBS, BY METROPOLITAN AREA

Area (SMSA)	Relative Price Units		Medicare/BS Price Ratio	Mean CV		CV of Medians	
	Blue Shield	Medicare		Blue Shield	Medicare	Blue Shield	Medicare
Statewide	.561	.523	.932	.049	.070	.253	.254
Pittsburgh	.533	.521	.977	.045	.064	.230	.251
Philadelphia	.595	.566	.951	.049	.064	.266	.265
Suburban Philadelphia	.582	.540	.928	.052	.070	.246	.246
Allentown-Bethlehem-Easton	.449	.446	.993	.052	.081	.179	.213
Altoona	-	.458	-	-	.082	-	.205
Erie	.525	.497	.947	.067	.062	.188	.173
Harrisburg	.565	.525	.929	.038	.073	.193	.227
Johnstown	.573	.465	.812	.018	.068	.220	.241
Lancaster	.528	.415	.786	.093	.072	.375	.235
Wilkes Barre-Scranton	.532	.518	.974	.041	.076	.207	.184
Beaver	.513	.487	.949	.046	.050	.203	.198
Reading	.426	.411	.965	.054	.088	.215	.195
Williamsport	-	.502	-	-	.068	-	.158
York	.462	.478	1.035	.036	.087	.189	.199
Non-SMSA Areas	.501	.483	.964	.036	.083	.185	.209

in Altoona under Blue Shield. Mean CVs for the selected pathology services are clearly smaller than average in Johnstown. Urinalysis (but not FBS) has a relatively large mean CV (suggesting possible price discrimination) for Medicare patients everywhere in the state, with Harrisburg and Erie standing out as having the largest. It is difficult to discern clear patterns of differences or similarities between areas for this group of services.

Physicians performing diagnostic radiology services have an unusually high level of price agreement with one another (CV of medians) in the Allentown-Bethlehem-Easton area, Erie, and Harrisburg. There is little diversity between different physicians anywhere in the state on prices of radiology services, but agreement is particularly close at these three places. The CV of medians for EKG is relatively small almost everywhere in the state, and there is nothing particularly striking to be seen in inter-area comparisons for this procedure. Erie, York and Williamsport have relatively low CV of medians (higher than average price agreement between different physicians in these areas) for FBS; but the CV of medians for urinalysis is relatively high (low agreement between physicians) at these same places, as well as throughout the state. For the referenced pathology services, differences between the two pathology procedures (anywhere) are much greater than any inter-area differences. Again, there are no clearly evident general patterns at this level of investigation.

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part Three:

Factors Related to

Physician Price Variation

By: Gene A. Markel

I. INTRODUCTION

Health care prices and expenditures in the United States have increased persistently over a period of many years, accounting for an ever increasing share of the nation's economic activity and recources. While generally overshadowed by prices for hospital care, the prices of physicians' services have been an important component of this growing health care cost phenomenon. To contribute toward a better understanding these phenomena, this study focuses upon the physician services component, seeking to identify and examine some salient factors related to the determination of prices in the market for physicians' services.

A. MEDICAL CARE COSTS AND PHYSICIAN PRICES

It is estimated that the total expenditure for health care in the United States in 1980 was $247 billion, an increase of 15.2 percent from the immediately preceding year (Gibson and Waldo, 1981). This represents 9.4 percent of the Gross National Product (GNP) for 1980, compared to 8.9 percent of GNP for health care expenditures in 1979; 7.5 percent of GNP a decade earlier, in 1970; and 4.4 percent of GNP in both 1950 and 1955. Of the 1980 total, some $217.9 billion was spent for "personal health care," defined to include only items specifically related to the health care of individuals, while excluding such other items as the administrative costs of health-related programs, nonprofit health research, and medical facilities construction, among others. Expenditures specifically for physicians' services in 1980 were $46.6 billion, up 14.5

percent from the corresponding figure for 1979, and representing 21.4 percent of all personal health care expenditures. Assuming no radical changes in programs or environment, it has been projected that by 1990 these figures could reach $821 billion for total health care expenditures, $731.4 billion for personal health care, and $150.3 billion for physicians' services (Freeland and Schendler, 1981).

Physicians' prices, as indicated by the physicians' services component of the Consumer Price Index (CPI), rose approximately 12 percent during calendar year 1981. To provide some historical perspective on the magnitude of this rate of increase, it may be helpful to compare it to characteristic annual rates of price change for three distinctly different periods over the past few decades: (a) 1950-1965, a period of relative stability following World War II and preceding the start-up of Medicare; (b) 1965-1971, the early Medicare period, up to the imposition of a period of price controls; and (c) 1971-1981, the most recent complete decade. Table 3-1, on the following page, shows the average annual compound rates of increase in the CPI and in selected CPI components for each of these time periods.

The table data show that in the pre-Medicare period the annual percentage rates of increase in physicians' fees, while running ahead of the national economy as a whole (all items), were only slightly greater than -- and generally comparable to -- changes in the "all services" component. It is broadly accepted that "all services" provides a more valid basis of comparison for physicians' services than would "all items,"

TABLE 3-1. AVERAGE ANNUAL INCREASES FOR SELECTED CPI COMPONENTS AND TIME PERIODS

CPI Component	1950-65	1965-71	1971-81
All items	1.8%	4.2%	8.6%
All services	3.1	5.7	9.2
Medical care	3.5	6.0	8.9
Physicians' services	3.2	6.7	8.8

since services have a common labor intensive character. In the middle period, the onset of Medicare brought about a new surge of demand which, in conjunction with other forces in the marketplace, is commonly taken to be a principal generator of stepped-up inflation rates in the medical care economy. Increases in physicians' prices moved significantly ahead of the general economy during this early Medicare period, leading the overall services sector as well. Since 1971, however, annual rates of increase in physicians' prices have tended once again to fall back more in line with the rest of the economy, and now are also averaging somewhat less than the rates of increase for the remainder of the service sector. It should be noted, of course, that the early part of this most recent decade included a 32-month period of wage and price controls. Average annual inflation rates indicated for the entire ten-year period (1971-1981) thus understate the most recent trends. Rates of increase for physicians' services since 1974 actually have averaged a bit more than 10 percent annually. These figures derived from CPI data are consistent with the results of in-house studies of the rates of change in billed charges reported on Blue Shield health insurance claims submitted by Pennsylvania physicians (Pennsylvania

Blue Shield, 1981). According to these studies, Pennsylania physicians' fees increased at an average annual rate of 9.0 percent between 1971 and 1981, and at an average rate of 10.4 percent per year during the more narrow post-control period from 1974 to 1981. These comparisons of rates of change in physicians' prices for different time periods, and with various other sectors of the national economy, also are highly conformable to similar observations made previously by Theodore and Warner (1976).

Price inflation in the medical services market is becoming an increasingly significant and difficult burden upon society. Publicly funded health care programs are placing extremely heavy budgetary demands upon government, even as the need for budgetary stringency, discipline, and control at all levels of government appears to grow more urgent. Rising health care prices and expenditures are viewed with alarm in the private business community as well. Business Week (February 8, 1982, p. 58) has noted that medical insurance now is costing business some $55 billion annually. The Ford Motor Company is reported to have paid an average of $3,350 per active employee for health care costs in 1980, adding approximately $290 to the price of every car they produced.

While there have been underlying inflationary forces in the economy as a whole, the underlying general inflation rate fails to explain fully all of the inflation manifested either in the market for physicians' services or in the larger overall health services industry. Many observers feel that the health services industry is significantly different from other sectors of the national economy (e.g., Altman and Eichenholz, 1976, pp. 10-12), and that inflationary problems associated with the industry are largely attributable to intrinsic characteristics of

the industry itself. A composite of external demand factors, industry characteristics, and market characteristics commonly suggested as contributing to physician fee inflation may be summarized as:

- o Increasing demand due to an increasing population base;
- o Shifts in the composition of the population, with increasing proportions of females and older persons, who tend to need and demand greater volumes of services;
- o Changing demand patterns associated with higher levels of population income, education, and general standard of living;
- o Advancing technology, with strong pressures for the acquisiton of expensive technologies, and pervasive demand for the "best" that technology has to offer;
- o Increasing input costs and production costs for physician services;
- o Restrictive laws and practices which tend to limit the available alternatives, and thus also limit certain kinds of efficiencies;
- o Certain practices of organized medicine generally regarded as anticompetitive;
- o Maldistribution of physicians, with respect to both specialty and location of practice;
- o Increasing prevalence and extent of insurance, both public and private, tending to cloak the true costs of medical care and to diminish cost consciousness on the part of both consumers and providers;

- Decisions on kinds and quantities of services being made by medical practitioners who ordinarily are reimbursed on a fee-for-service basis, thus giving them both incentive and opportunity to generate more services and more expensive kinds of services; and
- Consumers who generally are not equipped to make well-informed independent consumer judgments (Altman and Eichenholz, 1976; Theodore and Warner, 1976; Dyckman, 1978; Goldfarb, 1980).

Policy initiatives aimed at bringing physician fee inflation and other medical care costs under control have included regulation, overt price controls, attempts at self-policing within the industry, and attempts to stimulate competition. The record on the whole has not been good on any of these, with well-intentioned measures frequently having effects precisely opposite those anticipated and hoped for. With the encouragement of government policy, for instance, a conscious effort was mounted to increase the supply of physicians, on the presumption that increased supplies of physicians would both improve access to care and provide competitive pressures to help keep prices under control. The effort succeeded in producing dramatically increased supplies of physicians, but the newly increased supplies did not necessarily gravitate to the areas of greatest need. Moreover, contrary to expectation, increased supplies of physicians now frequently have been found to be associated with higher fees and higher levels of questionable utilization (a phenomenon discussed at greater length in Section II).

Spurred by increasing alarm at the relatively sudden and rapid acceleration in rates of inflation in the late 1960's and immediately thereafter, the Federal Government imposed the Economic Stabilization Program (ESP) on August 15, 1971, and continued it through a succession of phases until the authority expired on April 30, 1974. On the face of it, this extended flirtation with price controls was highly successful, particularly as the controls appeared to impact upon physicians' fees. The rewards were short-lived, however, as inflation resumed at even greater rates after the price controls were abandoned -- apparently compensating for pressures created at least in part by the controls themselves. There also is evidence indicating that California physicians during the ESP period managed to defeat the controls rather effectively through the simple expedient of delivering more services and shifting to more complicated case mixes (Holahan and Scanlon, 1979).

In addition to temporal (inflationary) volatility, physicians' fees also often exhibit substantial cross-sectional variations that have no immediately apparent or completely satisfactory explanation. A study of geographic variation in physicians' fees under Medicare and Medicaid in 1975 showed a difference of 174 percent in Medicare fees between the highest and lowest counties nationally, and a gap of 265 percent for Medicaid fees (Burney et al., 1978). Although these differences appear to some extent to be regionally oriented, a number of individual states showed significant intrastate variations as well. Much of the variation appears to be explainable in terms of differences between metropolitan and nonmetropolitan areas; but even accepting a differentiation between metro and nonmetro areas as a valid basis for variation, there is no ready way

of knowing whether the observed differences are appropriate, either in degree or in kind. Substantial price variations, both by specialty and by geographic area, similarly were revealed in a study of pricing patterns in the Pennsylvania physicians' services market (Markel and Dudley, 1981). As expected, specialist prices were found to be higher than generalist prices for (nominally) the same services; but further, there also were instances of substantial price variation between different physicians in relatively homogeneous specialty groups. Distributions of fees for representative office and hospital visits were found to have coefficients of variation ranging up to 0.37, even for controlled cohorts containing only medical specialists. Geographically, for an office visit of intermediate length, the variation between the Standard Metropolitan Statistical Areas (SMSAs) with the highest and lowest prices in Pennsylvania was 54.7 percent under Blue Shield coverage, and 41.4 percent under Medicare. In general, over a variety of physician procedures, the tendency was for the highest prices to occur in major metropolitan areas; but it was not conversely true that the lowest prices always occured in rural areas. To an almost striking degree, interarea variations in price (at the level of specific procedures) were not particularly orderly.

It thus is evident that there have been, and there remain, a great many problems and puzzles centering upon price behavior in the physicians' services market. One of the reasons -- perhaps the fundamental reason -- why the marketplace for physicians' services has been so remarkably resistant to cure and so difficult to manage is that there is insufficient understanding of either the structure or the dynamics of pricing in this market. It is not always clear why the same service should cost more in

one area than in another; why one physician should command a higher price than another for essentially the same service; how great a price difference is warranted, if any at all; what the comparative price levels for different services should be; or, more generally, what factors ultimately drive and influence the determination of physicians' prices. Echoing an observation made by Wildavsky (1977) and later reiterated by Rushefsky (1981, p. 721), no one really knows exactly how much medical care ought to cost. Generally speaking, the customary normative yardsticks by which prices are determined in many other markets simply do not exist in the physicians' services market. The market behaves perversely in many ways; and, in spite of numerous significant advances and useful contributions made by recent research, the market and its workings still are not adequately understood. Better understanding, as a guide to policy formulation in both the public and private sectors, is badly needed.

B. OUTLINE OF STUDY

This study addresses some of these concerns by exploring the relationship of a number of potential explanatory variables with empirically observed physician price variation in Pennsylvania. The price variables used here are cross-sectional relative price indexes for 1975 spanning forty-four representative procedures commonly performed by physicians. The price indexes are developed at the individual physician level for a representatively distributed sample of approximately half the physicians practicing in Pennsylvania. They depict each individual

physician's relative cross-sectional price position for the mix of services he performs, compared to the statewide average prices of other physicians performing the same procedures. Physician price variations, and their relationships with several possible explanatory factors, are investigated for the private Blue Shield, Medicare Part B, and aggregate Blue Shield and Medicare B physician services markets in the state of Pennsylvania, using price and quantity data extracted from claims experience files for these respective lines of business at Pennslvania Blue Shield. Factors and variables explored as having some possible value in explaining the observed physician price variation include a number of basic personal physician characteristics, practice characteristics, and practice locality characteristics. Physician and practice characteristics are compiled at the individual physician level and are matched to corresponding individual physician price data. Data on practice localities are at the county level, attached to individual physician records in the computer data base for the study. The relationships of the various possible explanatory variables to the price variables are investigated by analysis of variance and multivariate regression methods. The regressions here are used to estimate reduced form price equations. Further details of the study approach and methodology may be found in Section II.B.

C. BRIEF SUMMARY OF FINDINGS

At this point the findings will be skimmed only briefly to present some summary highlights.

In general, it is found that personal physician characteristics are able to explain much of the variation between different physicians' representative price levels, but the characteristics of practices explain relatively little. The physician's specialty alone explains 18 percent of the variance in physicians' prices, and board certification credentials account for an additional six percent of the variance. As expected, credentialing permits the physician to command a higher price for his services. Medical specialists have prices that are 12.5 percent higher than the average for all other physicians, and surgical specialists have prices 9.9 percent higher. Board certification on the average returns an additional premium of 6.0 percent in the price levels commanded by a physician, ceteris paribus. Certain other nominal physician characteristics do not necessarily work in the direction that might be anticipated, however. Foreign medical graduates (FMGs), for instance, have prices that tend to be significantly higher than the prices of physicians trained in U.S. medical schools; and osteopathic (D.O.) physicians have prices that on the average are 6.0 percent higher than those of their M.D. counterparts. The physician's age is significantly related to the prices of his services, with younger physicians uniformly tending to have higher prices. The difference between the youngest and the oldest cohorts of physicians in the aggregate Blue Shield and Medicare Part B market is 26 percent. Physicians who

practice in association with others, as opposed to solo mode, tend to have higher prices. This is true even when controlled for broad specialty groups. Practice characteristics generally describing the size or volume of the physician's practice, or his output, show no meaningful relationship to relative price levels. Differences in relative price do show a relationship with the intensity of services delivered per patient, with the general tendency being for higher levels of intensity to be associated with lower prices. The strength of association for this factor is rather weak, however.

The physician's practice locality, taken at the county level, accounts for 14.5 percent of the variance in physician prices. In general, as one would expect, prices are highest in the major urban center of Philadelphia, and are lowest in rural areas. These locality-based differences are explained to some extent in terms of certain characteristics of the localities. Some of the more important practice locality factors are found to be the population density, the locally projected consumer price index (CPI), the amount of Medicare Part B expenditures entering the local physicians' services economy, and the supplies of primary care physicians and medical specialists in the locality. All of these things are related positively to physicians' prices -- i.e., quantitative increases in any of these factors are associated with correspondingly higher relative price levels. As in the case of the practice characteristics cited above, however, these locality factors must be noted as having a relatively low level of explanatory power in relation to the prices of physicians' services.

Physician supplies in an area, and the relationship of physician supplies to prices, are a matter of some special interest. It is found that physicians' prices are very uniformly related to physician supplies in a positive manner. That is, greater supplies of physicians are correlated with higher prices for physicians' services in an area. This positive relationship between physician supplies and prices is contrary to what would be expected under most conventional economic models of markets. As a rule, the phenomenon is interpreted as an indicator that there may be some physician-induced demand operating in the market -- i.e., the physician creates demand for his own services without resort to price-inducement.

This study was not designed to produce positive proof of the exact nature of the physicians' services market, from among the various theoretical models of the market currently being considered by health economists. Nevertheless, it is concluded that the general pattern of facts and findings emerging from this study would be consistent with the physician-induced demand model, in the context of a monopolistically competitive market.

Detailed findings are presented in Sections IV, V, and VI; and a somewhat more comprehensive summary of the findings may be found in Section VII.B.

II. CONCEPTUAL BACKGROUND AND STUDY APPROACH

This section briefly reviews and summarizes key elements of relevant previous research and conceptual thinking on the market for physicians' services, with particular emphasis on physician pricing. The review of previous work is followed by a description of the approach and methods employed for this present (Part Three) study of factors related to physicians' prices in Pennsylvania.

A. THE MARKET FOR PHYSICIANS' SERVICES

Prior to 1970 there was relatively little research directed specifically to the physicians' services market. At about that time, however, some landmark publications began to appear (e.g., Feldstein, 1970; Fuchs and Kramer, 1972; Newhouse, 1970); and a new era of health economics research was launched. Spurred by federal government policy interests and funding initiatives, the level of activity in health economics research was significantly increased in the mid-1970's, and the field became increasingly productive. With this impetus, there followed an extraordinarily productive period, generally marked as beginning approximately in 1978 and continuing to the present time.

The past decade or two have witnessed a rapidly growing interest in trying to develop a better understanding of the basic nature and workings of the market for physicians' services. Stimulated by the alarming price inflation of recent years, an increasingly broad range of speculative thought and investigative effort has been applied to the search for

acceptable rational explanations of physicians' output and pricing decisions (among other physician behaviors). Although this effort has brought forth some interesting and useful advances, the development of a satisfactory and generally accepted theory of the physicians' services market -- including, in particular, an understanding of how physicians' prices are determined -- has nevertheless proved to be a remarkably elusive goal. Pauly (1980, p.3) has offered the view that understanding of how physician prices are set is "ultimately an empirical question," adding that there is at present no consensus on the issue.

1. Early Work: Competition or Monopoly?

An early focus of relatively contemporary research on the physicians' services market was concerned with the basic nature of the market, attempting in particular to determine whether the market is essentially competitive or monopolistic in character. In a competitive market, output and prices are determined through the equilibrium of supply and exogenous demand forces; and the market is characterized in part by perfectly elastic demand. The individual physician operating in such a market (or in a market reasonably approximated by such a model) accordingly would act as a price taker. If, on the other hand, the physician operates as a monopolist, he faces an essentially inelastic demand, and may act more arbitrarily as a price setter. In either case, the physician generally was assumed to be a profit maximizer.

Resolution of the competition versus monopoly issue was perceived to be important from the standpoint that this knowledge was needed as a guide to policy formulation, and as a guide to the definition

of appropriate interventions, by a federal government inclined at the time to be activist on this and other domestic social matters. If the market could be shown to be the conventional equilibrating competitive market, policy might most effectively be directed toward influencing -- and eventually modifying -- the conventional forces of supply and/or demand in the market. For a monopolistic market, on the other hand, it may be better to think in terms of regulatory approaches.

Respected and influential voices were heard on both sides of the question. Fuchs and Kramer (1972) viewed and modeled the market in terms of standard equilibrium-seeking competition processes. Newhouse (1970) concluded that the market was more essentially monopolistic. The question is still at issue, but in the intervening years up to the present, researchers have tended to move toward a consensus that the market is neither purely competitive nor purely monopolistic.

In the middle ground, the physician firm has been viewed by many as a monopolistically competitive enterprise -- or, at least, as being best approximated by this model. Monopolistic competition has characteristics essentially like those of the conventional competitive market, with the exception that each firm's product is different (or is perceived by consumers as being different) from competing products -- as opposed to the assumption of product homogeniety in a purely competitive market. This has the net effect of giving each individual physician firm a somewhat greater degree of market power and relative autonomy than would be obtained under pure competition. Notwithstanding some remaining doubts and contrary views in the research community, Lee and Hadley (1981,

p. 186) have suggested that it is now "standard" to view physician practices as monopolistically competitive firms.

For the sake of completeness, it also may be noted that it once was fashionable to think of the physician firm as a discriminating monopoly -- i.e., a firm that charges different prices to different consumers for the same product. In fact, economics textbooks commonly presented the physician as a classic example of the discriminating monopolist. While it is generally accepted that physicians traditionally have been known to engage in a considerable amount of price discrimination (e.g., discounting prices to the poor), it now is believed that this kind of discrimination no longer is practiced to any significant degree and is not an important consideration today. It is acknowledged, of course, that some physicians charge (accept) different prices for, say, Medicaid patients as compared to patients with private commercial insurance or Blue Shield. Contemporarily, however, this behavior is not generally conceived as price setting in a monopolistic market, but rather as price taking in a framework of multiple competitive (or monopolistically competitive) markets (Mitchell, Cromwell, and Schurman, 1981; Paringer, 1980).

2. Relation of Physician Supplies to Prices

Focusing upon the competitive versus monopolistic issue, economists in the early 1970's tended to analyze the market for physicians' services in terms of standard market models -- commonly assuming that the physician operated with profit maximization motives in a market driven toward equilibrium in either a conventionally competitive or a conventionally monopolistic framework. Using a standard profit-

maximizing competition model, Fuchs and Kramer (1972) noted some anomalies in the comparison of their empirical results with expected results. Of particular interest for present purposes, it was noted that the correlation of physician prices with the physician/population ratio (or physician supply) was relatively large and, contrary to expectation, positive. Further, this study also showed demand to be far more sensitive to physician supply than to price, with the direction of the effect again opposite from that expected on the basis of theory or intuition.

Several other researchers subsequently also found positive correlations or significant positive regression coefficients of physician supply with prices for physicians' services. There often were accompanying indications of increased output and apparently greater demand levels associated with increased supplies of physicians per capita. This was received initially as rather surprising news, and continues to be somewhat confounding and disturbing, since it is precisely contrary to behavior predicted by standard economic models. Standard models, as traditionally constructed, normally would predict that greater supplies of physicians should be associated with lower prices for physician services, as supply increases or shifts relative to existing demand.

3. Utility Concepts

To explain and reconcile discrepancies between "standard" theory and empirical observation, emerging alternative models and concepts commonly have tended to depart from the notion that physicians are motivated strictly by profit maximization objectives. In place of a pure profit motive, the physician is presumed to act as a utility maximizer.

The physician's "utility" in this sense is defined to be a function of his income, his leisure time, and other subjective factors having to do with professional satisfaction and personal quality of life. Since the physician's own time is a principal input to the productive and profit-making capacity of the firm, it thus becomes perfectly reasonable to adopt the premise that a physician may find his utility best served by trading away a certain amount of monetary income in favor of additional leisure time. Similarly, in the qualitative content of his practice, he may opt to forego relatively more profitable case mixes in order to take on at least a certain number of cases which he finds more interesting or psychically more rewarding. Or he may choose to have his family reside in a place that provides better cultural opportunities, low crime risks, better schools for his children, or access to preferred leisure activities -- and, if necessary, may willingly accept a smaller annual income as the price for these personal benefits.

The notion that market behavior of a physician firm may be driven by something other than pure profit motive is not a new idea. Feldstein, in his classic 1970 paper, took the position even then that "the traditional theory of the firm ... provides an inappropriate model of the physician's behavior," and continued by expressing his view that physicians' prices and output levels are determined to maximize utility, not profit. This view has become commonplace during the past decade and now serves as one of the cornerstones of much contemporary work.

If, indeed, the physician is posited as a maximizer of utility rather than of profit, this may go far to help rationalize and explain some of the observed market behavior and relationships that would have to

be considered anomalous in a purely profit-maximizing context. Quite simply, it allows that the physician may set his prices or his workload, or both, at some point other than the conventional profit-maximizing equilibrium point (either higher or lower) if it serves to help him realize one or more of his other, non-monetary objectives. On the other hand, it must be noted that this conceptual device does not provide a completely free exit from all problems. The concept of the utility function itself is not problem-free. While the notion of utility is a very useful abstraction, the conceptual foundations of utility may be revealed as very unclear and questionable when attempting to translate the abstraction into applicable real terms. If one chooses to worry about such things, the origins and epistemological bases of utility functions can be uncomfortably obscure. Moreover, in real applications, the components of utility commonly have to be expressed and measured in terms of proxies, which frequently are tenuous, low quality surrogates for what they are purported to represent.

4. Excess Demand Theories

Feldstein, in his early work, concluded that physicians set prices and outputs at levels to assure an excess of demand, so that the market never clears. This is the fundamental characteristic of a loosely aggregated group of alternative models and theories belonging to what may be referred to generally as the "excess demand" school of thought. As pointed out by Pauly (1980, pp. 4-5), it is possible to conceive of two main avenues to excess demand. Excess demand may arise in an essentially competitive market if the physician is unwilling to supply all that is

demanded at the exogenously determined price; or, if one assumes an essentially monopolistic market, the physician may consciously set price at a level which will fail to clear the market, thereby assuring excess demand. In the second situation, it may be assumed that the physician perceives and is motivated by some utility to be gained by the existence of excess demand. An excess of demand may, for instance, permit him to be more selective in his choice of cases, so that he can have a higher proportion of "interesting" cases. In a market characterized by excess demand, it is not difficult to envision that an increase in physician supplies could be associated with (in fact, could cause) an increase in output in the overall market, with no change in price, so long as the incremental supply is not sufficient to exhaust the excess demand and clear the market.

5. Physician Induced Demand

Fuchs and Kramer (1972) found the logarithmic regression coefficient of the physician supply variable (in terms of physicians per 100,000 population) to be relatively large, positive, and significant in all of their demand equations for which this variable was used. The elasticities of demand with respect to physician supply ranged from 0.34 to 0.51 and were highly significant. At the same time, it was observed that other variables customarily thought to be important determinants of demand -- e.g., price and patient income -- were far less influential than expected. From this it was concluded that physicians have substantial power to determine, or at least to influence, the demand for their own services and that they in fact exercise this power. Fuchs and Kramer were

not the first to suspect or to suggest that physicians may have this kind of power, but their 1972 study yielded some of the first important evidence of this phenomenon actually occurring in the market. As additional or reinforcing evidence subsequently was brought to light by other researchers, the concept of supply-induced demand (also known as physician-induced demand or, more simply, as demand-inducement) gained increasing attention, prominence, and respectability. In spite of its appeal to a large segment of the research community, the concept nevertheless is highly controversial; and it has become the focal point of much recent and current research on the physicians' services market.

The essence of the demand-inducement concept is that, as suggested ten years ago by Fuchs and Kramer, physicians have the ability to shift demand for their services, and that they in fact use this power to increase the demand for their own services with no resort to price as an instrument of demand creation or demand modification. It is important to note that this is envisioned as a demand shift, ceteris paribus, and not simply as movement to a new equilibrium on an existing demand curve. Moreover, the shift in demand is not exogenously induced, but rather is induced from the supply side as a conscious act of the principal supplier and orchestrator of productive inputs. This stands in stark contrast to the standard neoclassical position, which remains loyal to the view that price and output levels are determined by the equilibrium of traditional market forces -- the balancing of supply with exogenously determined demand.

One of the more serious proponents of supplier-induced demand is Evans (1974), who articulates the concept and the case for supplier-

induced demand at some length, citing evidence from Canadian experience. Demand-inducement, assuming it exists, would be most manifest and visible in situations where the physician acts specifically to counteract threatening developments in his market. Evans and others have pointed up two specific classes of situations in which this kind of demand-inducement may manifest itself. In the first, an increase in the supply of physicians may reduce the number of patients available to each physician. In this situation the demand-inducing physician could compensate for a reduced patient load by raising prices to a level which, even with a smaller workload, affords him the same income as before. Under the demand-inducement model, it would be possible for him to thus increase price at his own discretion without further eroding his volume. An alternative response to the same situation might be to simply "sell" more services per patient at existing prices. The second commonly cited kind of situation which could trigger a demand-inducement response would be an externally imposed constraint upon fees. In an inflationary general economy this would be tantamount to a decrease in real prices. Again, the demand-inducing physician could respond by "selling" more services and producing greater quantity at the same nominal price, thereby preserving his income level. In any of these situations, the more conventional theories would have led one to expect a strictly inverse relationship between price and volume of utilization, ceteris paribus.

In a study of surgeons, Fuchs (1978) observed that the supply of surgeons was significantly and positively related to both demand for and price of surgical operations. By concentrating upon surgeons and surgical practices, Fuchs reasoned that he could rule out some of the other

influences often suggested as possibly accounting for this phenomenon. For example: (a) there should be less ambiguity as to exactly what output was produced, since surgical operations tend to be well defined procedures; (b) it may be reasonable to presume that excess demand is not a factor; (c) time costs may be of substantially less importance; and (d) price data should be reasonably complete and accurate, since insurers tend to cover surgery quite thoroughly and keep records on these transactions. The study concluded that surgeons can and do have the power to shift demand for surgical operations, inducing demand for their own services, and concomitantly are able to set their own prices somewhat arbitrarily, independent of conventional market demand forces.

6. Agency Relationship

It is argued that the key to the physician's ability to induce demand lies in the fact that the physician is in control of a substantial portion of the informational inputs that help to shape demand. An uncommon degree of consumer ignorance is taken to be one of the hallmarks of the physicians' services market. This is consistent with the ordinary experience of almost everyone. The ordinary layman as a rule has little or no understanding of such things as physiological or disease processes, or of medical technology; and this, in fact, is why he turns to the physician -- to identify and define the problem, as well as to fix it. The physician is the expert, and the patient must rely upon him to advise and define the necessary or recommended care. Thus, in a very real sense, the physician acts as the patient's agent. This puts him on the demand side, as well as on the supply side, of the market -- i.e., the physician

is simultaneously the seller and an agent of the buyer. In using the power which this accords him, the physician may shift demand inward as well as outward, as suits his purpose (or, more esoterically, as it suits his utility). Thus, he can decide to do less (or the same) work for a higher price; or he can decide to do more work for a lesser (or the same) price. It also should be noted, however, that even if one accepts the demand-inducement premise, there is broad agreement that the physician is not totally unconstrained. Demand-inducement is taken to operate only within a certain domain, the limits of which are unknown but generally regarded (by those of the demand-inducement school) as being beyond the boundaries reached by the present real-world market.

7. Target Income Hypothesis

Another concept closely related to supplier-induced demand, and sharing many of its ideas, is the target income hypothesis. The essence of this line of thought is that physicians set their prices and output so as to achieve or maintain a targeted level of income. The physician is presumed to be able to accomplish this by manipulating the demand for his services, either delivering more services at a given price or obtaining a higher price for a fixed volume of services. Evans may be considered the principal proponent and developer of this concept, although numerous other writers and researchers also have at least considered the possibility of such a phenomenon.

A formal model of target income pricing was developed by Roehrig (1980), with somewhat incomplete and inconclusive results. As Roehrig points out, "the concept of target income pricing is not clearly defined

in the literature." Indeed, even on a simple intuitive level, there is no completely clear or satisfactory answer to explain exactly why or how such targets would be determined. This, of course, is a very fundamental question, the answer to which would be crucial to the theory. In spite of numerous difficulties with the target income hypothesis, it continues to have a certain conjectural appeal -- probably because, for some, it fits so nicely into preconceived notions of physician behavior, in the absence of any other generally accepted theory of physician pricing and output behavior.

8. Neoclassical Opposition to Demand Shift Approaches

The demand-inducement and target income hypotheses also have serious detractors. Sloan and Feldman (1978) favor the neoclassical view, arguing that the broad and innovative position taken by those who favor supply-induced demand models is conceptually weak. They prefer to explain observed associations of higher fees with higher physician-population ratios in terms of intervening quality and amenity variables. This is based on the idea that, if the supply of physicians increases, the individual physician can effectively compete (even though he may have a smaller average number of patients) by providing higher levels of quality and amenities, and by charging an accordingly higher price. "Quality" and "amenities" could relate to such things as physician credentials, a stronger patient-physician relationship, amount of time spent with a patient on a visit, physician availability, pleasant and attractive practice environment, and short waiting times. It is presumed, for instance, that many patients will very readily accept higher monetary

costs in trade for lower time costs -- especially those who are money-rich and time-poor. Sloan and Feldman feel that the apparently anomalous empirical findings which have driven many researchers to embrace demand-inducement and other non-standard models can be explained quite well in terms of standard models if one takes such things as quality and amenities into account.

Ramsey (1980), taking an extremely critical view of the demand-creation and target income approaches, concludes that both are faulty. Applying stringent but reasonable standards, he finds these models to be generally mis-specified, badly identified, and formulated in a careless, illogical, and inconsistent manner. Ramsey strongly prefers the standard neoclassical model, which he finds consistent with the facts. Pauly (1980, p. 117), while not committing strongly to either side of the argument, nevertheless also advises that the standard maximizing models should not be too easily or too quickly dismissed.

Pauly and Satterthwaite (1980) propose another alternative theory, which they call the increasing monopoly theory. An underlying premise, as with other alternative models, is the existence of consumer ignorance and uncertainty both about products and about prices in the physicians' services market. It is argued that an increase in physician supply results in less consumer information on the average about each supplier in the market. With this increasing consumer uncertainty, in the context of a monopolistic competition model, the demand curve facing each individual physician becomes less elastic, and the equilibrium price rises. No demand-creation features or assumptions are required. Empirical results, although regarded as only preliminary, indicate good

conformity with the increasing monopoly model. Pauly and Satterthwaite conclude that this model should compete very well with both the target income model and the neoclassical competitive model in explaining physicians' prices.

The stakes in the argument concerning supply-induced demand are quite high. If, indeed, it is possible for physicians to induce shifts in the demand for their own services, then the concept of consumer sovereignty in the market for these services is completely undermined. This, in turn, undermines the efficacy and applicability of standard equilibrating models of the marketplace, since these in general require an exogenously determined demand. If standard models are not relevant in the final analysis, then neither are all of the things that these conventional models usually are presumed to be able to tell us. This, of course, is precisely what those of the "broad" (not "standard") school are saying; it is the standard models' apparent lack of relevance that motivates these researchers to seek alternatives. The implications are obvious and enormous, both for policy makers (and policy analysts) who may be left with no clear or satisfactory guidance, and for those researchers who hold to standard models as the core of their stock in trade.

Reinhardt (1978) tends to side with the supply-induced demand school -- or, as he prefers to call it, the Parkinsonian school (after C. Northcote Parkinson's famous law that work expands to fill the time available for its completion). The totality of Reinhardt's position, however, is that he finds neither view in this debate to be entirely satisfactory. The neoclassical result often is contrary to empirical observation; but, on the other hand, the Parkinsonian point of view has

no adequate theoretic or analytic basis. He points out that consumer ignorance, which is the keystone of the demand-inducement concept, is not unique to medical care. Noting that increased price concomitant with increased physician supply frequently is taken as evidence of supply-induced demand, Reinhardt further points out that increased price is not a necessary condition for supply-induced shift. It also remains unclear (and probably dubious) that increased price alone is a sufficient condition for such shift. Still, Reinhardt remains skeptical of the strict neoclassical view, on grounds that the neoclassical models simply fail to explain away unsatisfying phenomena vis-a-vis empirical observation. Hadley et al. (1979) similarly feel that neither side in the debate has proven its case or disproven the other; and moreover, they suspect that the issue may never be resolved.

9. Summary: Is the Physicians Services Market Different?

A few years ago, people began to wonder quite seriously whether medical care markets really are different from other markets. From today's perspective, it may perhaps be more appropirate to ask whether medical care is so different that standard models do not even apply. Those who have embraced the notion that physicians can shift the demand for their own services are clearly saying "yes." Pauly (1978), for one, also seems to conclude "yes," but adds that the difference does not always matter as much as some may suppose. Still others, as noted above, feel very strongly that standard market models and theories continue to be quite applicable to the physicians' services market.

In looking at this market, some of its more important characteristics, not all of them necessarily unique, may be summarized as follows:

(1) The market deals in a service product, which introduces certain complications arising from the simultaneity of production and consumption.

(2) There is restricted entry of suppliers into the market, owing to licensure requirements and professional control of medical schools.

(3) There is heavy third party presence in the market, consisting of both private insurance and subsidies through government programs.

(4) Professional "ethics" effectively have barred such practices as advertising, price cutting, and other traditional forms of open competitive behavior.

(5) Historically, the market has been marked by a substantial amount of charitable activity and participation of nonprofit organizations and institutions. In addition, there has been significant intervention in the market through such means as government regulation and price controls. All this has the net effect of appearing as "noise" and perturbations to the natural functioning of the market.

(6) There is a strong technology component in the market. New technologies are introduced with increasing rapidity, and

old technology obsolesces. The new technologies sometimes are very expensive.

(7) There is considerable consumer ignorance and uncertainty in the market, giving rise to the agency relationship whereby the physician serves simultaneously as the seller and as the agent of the buyer.

(8) Contrary to the assumption commonly made by traditional standard models in the theory of the firm, the physician is not necessarily a profit maximizer. The physician appears rather to be a utility maximizer.

None of these features is entirely unique to the physicians' services market. On the other hand, some of them may exist to a somewhat greater degree in the physicians' services market than in most other markets. Consumer ignorance (agency relationship) and third party presence (insurance), in particular, are probably more prominent in this market than in most other markets. It also is significant that the physician's behavior is more likely that of a utility maximizer than a profit maximizer.

In attempting to rationalize and understand basic market character, mechanisms, and relationships, there appear to be three main classes of choice: (1) standard neoclassical market models, either competitive or monopolistic, but most likely some form of monopolistic competition; (2) excess demand models, which in a competition setting could be triggered by price controls, or in a monopoly environment could fail to clear the market as a reflection of the physician's own

preference; (3) demand shift models, either target income or supplier-induced demand. In the present state-of-the-art, none of these models is generally accepted as clearly correct or superior to the other. The demand shift alternatives are extraordinarily disturbing to neoclassical purists; and, in general, it is true that these models are not well grounded conceptually. The excess demand models, as pointed out by Pauly (1980), do not in general permit demand curves to be estimated, and are less than completely satisfying. The equilibrating models -- whether competitively or monopolistically oriented -- simply do not conform sufficiently or reliably with the facts.

One of the few points on which there is broad and substantial agreement is that the market for physicians' services behaves perversely by most normal standards and, to a significant degree, probably is different from other markets. It also is generally agreed that, in spite of a great deal of recent good research, we still do not know enough about how this market works, how to model it, or how to manage it. It is becoming increasingly important and urgent to find these things out.

B. STUDY APPROACH AND METHODOLOGY

Although previous work on the market for physicians' services has tended in the main to follow and reflect the research strategies, methods, and general orientations of the professional economist, the methodology for the present study is more characteristically that of the operations researcher and has a strong heuristic flavor. There is no explicit a priori commitment to any specific formal econometric model of the

market, nor any formal a priori conception of the nature of the market or of its working mechanisms. In simple and straightforward terms, the objectives of this study are to take a broad, fresh, and open-minded look at physicians' prices vis-a-vis a number of variables that potentially may be related to the determination or explanation of physicians' prices; to identify those factors that appear to be most saliently related to individual physicians' relative price levels; and to draw some inferences concerning the nature of the physician services market and the determination of public policy relating to that market.

1. Overall Strategy and Study Design

The foundation of this study is an extensive and detailed data base of representative price information for aproximately 10,000 individual physicians, derived from Pennsylvania Blue Shield paid claims files for both Medicare Part B and Blue Shield private business for 1975. This is complemented by an equally extensive data base containing more than 100 variables describing individual physician characteristics, practice characteristics, and characteristics of practice locales, all matched to price data at the individual physician level.

The initially large set of potential explanatory variables was systematically reduced to a much smaller and more manageable subset exhibiting relatively strong and significant association with the empirically observed physician price data. All of the analysis was conducted in a cross-sectional framework, with the objective of identifying -- and measuring the relative influence of -- those physician characteristics, practice characteristics, and practice locale factors

appearing to have some power in explaining cross-sectional variation in prices between individual physicians and between various physician cohorts.

Single-valued cross-sectional price indexes were developed to provide a measure of each individual physician's characteristic price level relative to prices charged on the average by other doctors for comparable services. For each physician, separate price indexes were calculated for services provided under Blue Shield coverage and under Medicare Part B, as well as for the aggregate of the physician's Blue Shield and Medicare business.

Preliminary analytic stages employed correlation analysis to assess the pair-wise association of each of the potential explanatory variables with each of the three price index variables, as well as to assess the relative independence or multicollinearity of the explanatory variables themselves. The preliminary assessment also employed factor analysis to sort out the main classes of variables and to identify dominant individual variables distinctly associated with each factor class. The initial data set was substantially reduced through these preliminary analyses.

End results presented in this report were obtained by applying breakdown analysis, analysis of variance (ANOVA), and multivariate regression analysis techniques to the partially reduced data set. Results were generated separately for each line of business (i.e., Blue Shield and Medicare B), as well as in the aggregate; and separate sets of results were generated for broad specialty cohorts, as well as for the overall physician population sample.

2. Cross-sectional Price Indexes

Pennsylvania Blue Shield claims experience data are captured and maintained for research purposes at the individual procedure level. Drawing from these source data resources, price data for these studies concentrated upon fourty-four specific procedures selected as being reasonably representative of those commonly performed by Pennsylvania physicians. (The rationale for procedure selection is discussed later, in Section III.A.) The data base developed for this project contains average prices charged by each of nearly 10,000 individual physicians, for each of the selected procedures on which the physician reported at least ten services on claims to Pennsylvania Blue Shield during the data base year (1975). While this provides an uncommonly rich and detailed data base of physician price information, there also are some significant practical problems in attempting to deal with so much detailed information at the individual physician and procedure level.

In general, cross-sectional comparisons of prices charged by different physicians over a variety of specific procedures show disparate and sometimes confusing patterns. The generally high-priced doctor does not necessarily have uniformly high prices, relative to other doctors' prices, for all of the specific individual procedures he performs; and conversely, the doctor who is generally low-priced may in fact have relatively high prices for certain selected procedures. It is not at all uncommon for a given physician, or cohort of physicians, to have comparatively high prices for one procedure, but relatively low prices for another. Previous descriptive work has shown that patterns of variation

in physicians' prices at the individual procedure level, when examined for several different procedures concurrently, can exhibit a marked lack of any apparent rationality (Markel and Dudley, 1981). This is further complicated by the fact that not all physicians perform all procedures.

To facilitate rational comparison of different physicians' prices, a composite single-valued measure was constructed, indicating the relative level of each individual physician's aggregate pricing behavior over the several selected specific procedures. This was accomplished for present purposes by calculating a cross-sectional price index for each specific physician represented in the data base:

$$\text{Price Index} = \frac{\sum_i q_i p_i}{\sum_i q_i \bar{P}_i}$$

where q_i is the number of services reported by the individual physician for procedure i; p_i is the individual physician's average price for procedure i; and $\bar{P}_i$ is the statewide average price for all physicians reporting procedure i.

Thus constructed, the physician price index is a cross-sectional price relative providing an aggregate measure of each individual physician's price levels relative to statewide average prices, weighted to reflect the individual physician's specific mix of services. For any specific procedure not appearing in a given physician's claims experience, q_i will be zero, and thus that procedure disappears from the equation.

Separate physician-specific price indexes were calculated for (a) relative price levels reflected in the physician's Blue Shield claims experience alone (BSINDEX) and (b) relative price levels reflected in his Medicare Part B claims experience (MBINDEX). These two indexes describe the physician's relative pricing behavior under Blue Shield and Medicare, respectively, viewing each as a closed system. In addition, a weighted aggregate price index (AGINDEX) was developed for each physician, providing a measure of his overall relative price level as reflected by combined Blue Shield and Medicare experience.

3. Statistical Breakdowns and Analysis of Variance

Statistical breakdown and one-way analysis of variance (ANOVA) routines from the Statistical Package for the Social Sciences (SPSS) were used for a bivariate analysis of physician price index data with each potential price-explanatory variable. The set of explanatory variables at this stage was the partially reduced set remaining after preliminary correlation analysis and factor analysis stages. Separate statistical breakdown and ANOVA series were generated for each of the three price index variables (BSINDEX, MBINDEX, and AGINDEX). Further, in addition to breakdowns and ANOVA for the overall population of physicians represented in the data base, breakdowns and ANOVA were conducted within each of four broad specialty cohorts -- viz., general/family practice physicians, medical specialists, surgical specialists, and other specialists. The general design thus was a complete factorial, crossing two lines of business (Blue Shield and Medicare) against four broad specialty cohorts,

plus analyses of the aggregate combined lines of business and the combined overall physician population.

For analysis of price index data relative to variables having a nominal or other discrete form, the physician population was sorted into various kinds of subgroup breakdowns defined by these variables -- e.g., specialty, county of practice, board certification status, physician age group, etc. Average price indexes were calculated for the various physician subgroups defined by each sorting variable. The patterns manifested in these breakdowns could be visually observed and subjectively assessed. More objectively, the eta-squared statistic generated by the SPSS package with each breakdown could be interpreted as a measure of the proportion of variance in the price index variable explained by the nominal/discrete breakdown variable. As such, the eta-squared measure and its accompanying statistical significance measure together served to provide a good general indication of the strength of association between paired explanatory (independent) and physician price (dependent) variables.

Several other factors used in this study (most particularly, those used to describe physician practice locales -- e.g., population characteristics, socioeconomic factors, medical service supply and cost factors) are essentially continuous variables, not suited for use as natural sorting variables. While variables of this type can be transformed to discrete interval form, it was felt to be more expeditious to make the interval conversion on the three price index varibles, rather than on the relatively much larger number of continuous explanatory variables. The physician population was sorted into quintiles based upon

the price index variables, in effect partitioning the physicians into five equally sized groups ranging from the lowest-priced 20 percent of all doctors to the highest-priced 20 percent. The average value of each potential explanatory variable of continuous type was calculated for each physician price quintile. Again, the pattern of variation of each such variable over the price level quintiles was visually displayed and evaluated. Also, the eta-squared and significance measures for each statistical breakdown again were taken as indicators of strength of association between paired price-level variables and price-explanatory variables. It is recognized, of course, that this switches the price variable to the role of the independent variable in each pair. Even though this then places the presumed "explanatory" variable in the position of the dependent variable, some interesting results were obtained, along with useful evidence of pair-wise association between given price variables and price-explanatory variables. No assumptions or conclusions are drawn regarding casuality or direction of the effect observed in any of these pair-wise associations.

A brief caveat also should be issued at this point, concerning the general level of interpretability of analysis of variance results. It may perhaps be said that one of the advantages of a one-way analysis of variance approach is its very simplicity -- the direct comparison of two and only two variables to see how much of the variation in one can be accounted for by the other. There is a hazard, of course, in the obverse side of this simplicity. An indicated strength of association, while real, sometimes can be deceiving. In the present case, for instance, several different potential explanatory variables may be found to be

associated with physicians' relative price levels. The problem is that any number of them also may be strongly interrelated with each other. If one finds that variable A has a strong association with the price variable, it may be that the observed associational effect is less attributable to variable A, per se, than to some other variable, say B, which also happens to be strongly related to A. The point in all of this is simply that one must exercise a bit of caution and thoughtful good judgment when evaluating results from an analysis of variance.

4. Regression Analysis

The final analytic stage in this study is based upon a series of multivariate regressions, using the method of ordinary least squares (OLS) from the SPSS package to obtain reduced form price equations. These were performed as logarithmic regressions, thus permitting the regression coefficients to be read directly as elasticities and greatly facilitating interpretation of results. A number of variables representing both demand side and supply side effects were regressed against each of the three price index variables (AGINDEX, BSINDEX, and MBINDEX). Separate series of regressions were run for primary care, medical specialty, and surgical specialty cohorts, as well as for the overall physician population represented.

Additional details of the regression analysis methodology are given in the introductory portion of Section VI.

III. DATA BASE AND STUDY VARIABLES

An extensive data base of detailed information on prices and quantities of services delivered by physicians has been compiled for this study of Pennsylvania physicians' pricing practices, and of factors related to their pricing behavior. Data have been collected and developed at the level of the individual physician for more than 11,000 Pennsylvania physicians. These price and quantity data were extracted from claims transaction files created in connection with claims processing operations at Pennsylania Blue Shield (PBS) for both Medicare Part B and private Blue Shield programs. The study focuses upon forty-four representative, well-defined, and frequently performed procedures in a 1975 time frame. The selected procedures, although relatively small in number, account for nearly 40 percent of all services for all procedures in PBS private Blue Shield business, and more than half of all services for all procedures reported to PBS under Medicare Part B. Physicians represented in the data base are all those who reported claims within a given line of business (i.e., Medicare or Blue Shield) for at least ten services for any of the forty-four criterion procedures during the year 1975. In total, the price and quantity data base developed for physicians' services in this study contains close to six million individual transaction records.

To support a study of factors related to the observed pricing practices, a matched data base of individual physician characteristics and selected practice characteristics also has been developed. Drawing upon American Medical Association (AMA) and American Osteopathic Association (AOA) reference sources, as well as upon various in-house PBS files,

nearly 10,000 physicians from the price and quantity data file were matched to produce an extensive and detailed composite file of physician characteristics, practice characteristics, and related price data.

In addition, a file was developed containing more than sixty variables describing each of Pennsylvania's sixty-seven counties. Information in the county data file was attached to the individual physician characteristics file by virtue of knowledge of the county in which each physician practices. These county level data were used as the best available information to characterize each physician's practice locale.

The complete data set supporting these studies contains approximately 150 data items for each of 9,827 Pennsylvania physicians, spanning personal physician characteristics, practice characteristics, and characteristics of practice locale for each individual physician. Of the 9,827 physicians represented in the data base, 8,322 (84.7 percent) are represented for private Blue Shield experience; 9,102 (92.6 percent) have Medicare experience; and 7,597 (77.3 percent) have experience in both lines of business.

Since PBS private Blue Shield and Medicare claims experience files provided one of the primary sources from which this data base was developed, it should be acknowledged that claims data bases typically contain a significant amount of inaccurate and spurious data. These source data problems arise from a variety of causes -- e.g., miscoding, erroneous reporting, data entry errors, supplemental claims relating to old claims appearing as new claims, and others. Meticulous data quality control procedures were followed to assure that incorrect, spurious, and

invalid data have been detected and cleaned out of the project data base to the greatest extent possible.

A. PRELIMINARY REDUCTION OF VARIABLES

The complete original data set for each physician contained a great many variables which ultimately turned out to have little or questionable significance, or which accounted for negligible proportions of the variance in the response variables. In addition, the full starting set of variables contained a number of subsets of deliberately redundant variables -- i.e., different variables to measure more-or-less the same thing. For example, mean family income, median family income, and per capita income all were included as available alternative population income measures. One of the objectives was to determine which variable, from among such a set of alternatives, would be most effective in terms of strength of relationship to the response variable(s), and/or would be less confounded with other candidate independent variables. This early-stage reduction of the overall set of variables was accomplished primarily through simple correlation and factor analysis methods.

For brevity, and because there would be little value to be served for present purposes, there will be no discussion here of the many variables which were discarded in the process of reducing the data set. The remainder of this discussion will concentrate upon the relatively smaller set of variables which ultimately were carried through into the ANOVA and multivariate regression stages and which were found to be of some interest or significance there.

B. PHYSICIAN PRICE VARIABLES

Cross-sectional price indexes were calculated, giving for each individual physician a composite measure of his price levels relative to statewide average price levels, weighted to reflect each physician's individual mix of services. The rationale and methodology for calculation of the cross-sectional price indexes have been discussed previously, in Section II.B.2 of this report. As pointed out in the earlier discussion, separate physician-specific price indexes were calculated to indicate each physician's relative overall pricing levels for Blue Shield alone (BSINDEX), for Medicare Part B alone (MBINDEX), and for Blue Shield and Medicare in aggregate (AGINDEX). In examining the relationship of potential explanatory variables to physicians' pricing behaviors, it thus is possible to differentiate between pricing behavior as reported to Blue Shield and as charged to Medicare, as well as to examine relationships to overall pricing behavior as reflected by the combination of Medicare and Blue Shield

C. BASIC PHYSICIAN CHARACTERISTICS

The record for each individual physician indicates his location of practice (county), degree (M.D. or D.O.), practice specialty, broad specialty category (general, medical, surgical, or other), medical school from which graduated, and status with respect to board certification, national professional association membership, and Blue Shield participation.

Doctors of Medicine (M.D.) were found to comprise 88.7 percent of the sample, with the remaining 11.3 percent being Doctors of Osteopathy (D.O.). Overall, 87.5 percent are Blue Shield participating physicians.

A breakdown by specialty shows (for some illustrative major specialties) 2,547 (25.9 percent) in general practice, 823 (8.4 percent) in family practice, 935 (9.5 percent) in general surgery, 646 (6.4 percent) in obstetrics-gynecology, and 1,414 (14.4 percent) in internal medicine. These are self-designated specialties. In broad summary, the physician sample consists of 34.3 percent in general or family practice, 27.5 percent in medical specialties, 32.5 percent in surgical specialties, and 5.7 percent in other specialties (anesthesiology, radiology, pathology, etc.).

Board certification credentials are held by 42.3 percent. National professional association (AMA or AOA) membership is held by 77.3 percent. Professional schools within the state of Pennsylvania produced 68.4 percent of the physicians in the sample; 21.5 percent are from other medical schools throughout the United States; and 10.1 percent are foreign medical graduates (FMGs).

To the extent that master listings were available to facilitate checking of these sample distributions, it can be said that the distributions for all stratifications in the sample are highly representative of the actual stratification reflected in the PBS physician masterfile and other authoritative sources.

In addition, the record indicates the physician's age (as of 1975). The original data set also contained a variable indicating number of years since licensure, but this was dropped from the final stage analyses, since

in most cases it carried roughly the same informational value as the physician's age variable.

The record further includes a variable showing the number of physician associates with whom the physician is involved in his practice. This serves as a proxy for determining whether the physician practices solo, small partnership, or group. If two or more physicians practice together as a single business entity, they may establish an "assignment account" with PBS. Allowed payments then are credited to the assignment account instead of to individual member physicians. There is no record at PBS to indicate whether a physician's mode of practice is solo, partnership, or group, per se. There are, however, cross-reference files indicating membership in assignment accounts; and from these files it is possible to determine the number of other physicians with whom a given physician has business association in his practice. It is assumed that business association implies clinical association.

D. ADDITIONAL PRACTICE CHARACTERISTICS

Several additional variables were derived from the data found in PBS claims transaction files (both Medicare and private Blue Shield) for each physician, to reflect some of the summary patterns and characteristics of his practice. The following is a list of those which were carried into the final analysis stages and which provide some of the main substance of the findings to be given later in this report:

(1) Number of Patients Seen. This gives the number of distinctly different patients seen by the physician during the course of the year, as reflected by claims transaction records. Three different variables were developed, giving the number of Blue Shield patients, the number of Medicare beneficiaries, and the total number of patients seen (taking Medicare and Blue Shield together). These variables serve the straightforward purpose of indicating the sizes of the patient rosters served by physicians under two different insured programs and in aggregate.

(2) Percent of Patients Medicare. Derived from the above, this variable indicates the annual number of different Medicare patients seen, as a proportion of the total number of Medicare and Blue Shield patients in aggregate.

(3) Number of Services. Three variables give, respectively, the annual total number of services reported for Blue Shield, Medicare, and in aggregate. This serves as a measure of the physician's relative activity level, but does not differentiate between qualitatively different kinds of services, and hence cannot be interpreted as a productivity measure.

(4) Billings. Three different variables give the total annual dollar volume of a physician's billings reported on claims submitted to PBS for Blue Shield, Medicare, and in aggregate.

(5) Mean Charge per Service. In common parlance, this serves as an indicator of whether the physician deals in "big ticket" services or in relatively lesser valued services. Since this variable would in part tend to reflect a physician's relative price position (for comparable services) as well as the intrinsic value of the kinds of services delivered, it has been adjusted to remove the influence of a physician's relative price position. This was accomplished by dividing the raw mean charge per service by the physician's individual relative price index. The resulting variable is an adjusted mean unit charge per service, and should in many ways be analogous to an average Relative Value for the mix of services delivered by a physician. Three variables again have been calculated -- for Blue Shield services, for Medicare services, and for the aggregate.

(6) Mean Services per Patient. This serves as a measure of the intensity of the physician's activity relative to his patient roster. If the services being compared are relatively homogeneous, a high value on this variable relative to the norm might indicate a physician who is overutilizing (or inducing demand for his own services). This variable is calculated for Blue Shield, for Medicare, and for the aggregate.

(7) Percent UCR. This is a single variable indicating the proportion of the physician's services to Blue Shield

patients which are covered and reimbursed under the UCR (usual, customary, and reasonable) program. It is included because of the long-standing interest in role and impact of UCR reimbursement methodologies in the medical marketplace. Specifically, the UCR approach commonly is conjectured to have an inflationary impact on the prices of physician's services.

It should be noted that all of the above measures used to characterize a physician's practice are determined only on the basis of what is available in private Blue Shield and Medicare Part B claims transaction files at PBS. In some cases, therefore, the measures may be somewhat imperfect since they cannot reflect a physician's uninsured activity, Medicaid activity (except for joint Medicare/Medicaid), or activity under commercial insurance programs. There is no knowledge of such activity from the sources used. On the other hand, it also may be noted that this problem is assuaged somewhat by the fact that PBS has a very dominant share of the health insurance market in the state of Pennsylvania, covering close to two-thirds of the state's population under Medicare and private Blue Shield combined.

Table 3-2 displays a summary list of the physician variables discussed above (other than nominal-level variables), showing selected distribution parameters for each variable (population mean, coefficient of variation, and skewness). The large coefficient of variation and skewness for some of these variables stems from the fact that 15 percent of the sampled physicians had no Blue Shield experience and 7 percent had no

TABLE 3-2. SAMPLE DISTRIBUTION PARAMETERS FOR SELECTED PRACTICE CHARACTERISTICS (1975)

Practice Characteristic	Mean	C.V.	Skewness
Annual number of Blue Shield patients	127	1.76	8.17
Annual volume of Blue Shield services	457	1.60	5.05
Annual Blue Shield billings	$17,700	1.51	3.47
Adjusted mean charge per Blue Shield service	$56.02	1.26	3.99
Mean services per Blue Shield patient	3.34	.83	3.57
Percent of Blue Shield line items under UCR	66.7%	.31	.68
Annual number of Medicare B patients	119	1.15	4.07
Medicare patients as percent of aggregate	58.4%	.55	.28
Annual volume of Medicare B services	1,030	1.31	3.18
Annual Medicare B billings	$17,591	1.32	3.94
Adjusted mean charge per Medicare B service	$24.92	1.40	8.64
Mean services per Medicare B patient	8.11	.78	1.99
Aggregate annual number of patients	246	1.24	5.94
Aggregate volume of services	1,341	1.29	3.31
Aggregate annual billings	$31,282	1.31	3.60
Aggregate adjusted mean charge per service	$36.97	1.53	8.48
Aggregate mean services per patient	6.36	.81	2.39

Medicare Part B experience. The very large coefficient of variation and skewness for adjusted mean charge per service under Medicare and in the aggregate would be a reflection of the diversity of different types of physicians represented -- e.g., general practictioners typically delivering intrinsically low-valued services, together with some surgeons delivering services that are intrinsically very high valued.

E. PRACTICE LOCALE (COUNTY) VARIABLES

Each physician's practice locale is identified and characterized at the county level. These county data were gathered primarily from standard open reference sources, augmented by data derived from PBS in-house files. The county variables carried through to the ANOVA stage are listed below, sorted into three main groups: (1) general demographic and socioeconomic variables; (2) cost and supply factors associated specifically with the medical services economy; and (3) medical care insurance and subsidization factors.

(1) General Demographic and Socioeconomic Factors:

- Population density
- Percent minorities
- Percent aged 65 or older
- Per capita family income
- Percent of families below poverty level
- Median years education
- Percent college graduates in population

Percent laborers in workforce

Percent of workforce unemployed

Percent voted conservative

Consumer price index (CPI)

(2) Medical Services Economy:

Hospital beds per 100,000 population

Direct patient care physicians per 100,000

Primary care physicians per 100,000

Medical specialists per 100,000

Surgical specialists per 100,000

Mean monthly pay per physician's office employee

Median monthly contract rent

(3) Health Care Insurance and Subsidization:

Blue Shield penetration

Annual Blue Shield payments per capita

Annual Medicare allowed charges per capita

Per capita state medical expenditures

In group (1), the "percent conservative" was determined from state voting records for the 1972 and 1976 national presidential elections. Those voting for Republican or Constitutional party candidates were classed as "conservative." Those voting for candidates of the Democrat or other liberal-oriented parties were classed "liberal." Votes shown as being cast for "others" were not counted, since there was no basis for

determining liberal-conservative preference in these votes. The resulting variable provides an indicator of the relative political positioning of each county's population on a liberal-conservative scale.

CPI data at the county level are not available from the government or from any routinely published sources. To provide a measure of the general underlying inflationary pressure upon prices in each county, the parameters of an OLS regression equation were estimated from federal CPI data, with selected population and economic indicators serving as independent variables, for Standard Metropolitan Statistical Areas (SMSAs) in and around Pennsylvania. Estimated county-level CPI figures then were projected by plugging the required population and economic indicators for each county into the regression equation.

All other variables in group (1) have definitions and potential relevance that should be familiar and well understood.

In group (2), the mean monthly pay per employee in physicians' offices serves as a variable providing a measure of the office personnel cost factor in office-based physician practices in each county. Data for this variable were obtained from County Business Patterns, published by the U.S. Bureau of the Census. Median monthly contract rent, also obtained from Bureau of the Census sources, is used as a proxy for the cost of office space/facilities.

In group (3), Blue Shield penetration is defined as the percentage of the county population who are estimated to be Blue Shield subscribers. A "subscriber" is defined as anyone covered under a Blue Shield agreement, including family members as well as the specific individual in whose name the agreement is issued.

Annual Blue Shield payments, Medicare Part B allowances, and state medical expenditures per capita all are calculated relative to the entire population base in each county, rather than being related to the more specifically delimited population bases for each individual insurance program or funding source. The intent in this is to develop variables that can serve as measures of insurance and government program monies entering the overall physician services economy for each county. Per capita state expenditure includes all expenditures by the state government for programs with direct medically-related purposes.

Table 3-3 provides a summary listing of these variables, characterizing their distributions in terms of population means, coefficients of variation, and skewness. It should be remembered that these are not "average county" data distributions. Rather, they are distributions which follow and reflect the distribution of individual physicians by county.

TABLE 3-3. DISTRIBUTION PARAMETERS FOR SELECTED LOCALITY CHARACTERISTICS (c. 1975)

Locality Characteristic	Mean	C.V.	Skewness
Population density	3,997	1.41	1.20
Percent minorities in population	11.2%	1.18	1.10
Percent aged 65 or older	12.4%	.14	-1.19
Per capita income	$3,172	.16	.76
Percent of families below poverty level	7.8%	.37	.24
Median school years completed	11.66	.05	- .29
Percent college graduates in population	9.1%	.42	1.17
Percent laborers in workforce	4.8%	.24	.08
Percent of workforce unemployed	5.7%	.22	- .30
Percent voting conservative	47.3%	.21	- .21
Consumer price index (CPI)	116.4	.01	- .74
General hospital beds per 100,000 population	480.2	.39	.18
Direct patient care physicians per 100,000	114.2	.38	1.92
Primary care physicians per 100,000	50.7	.24	.36
Medical specialists per 100,000	28.2	.50	.10
Surgical specialists per 100,000	26.9	.59	2.02
Mean monthly pay per phys. off. employee	$1,307	.17	.05
Median monthly contract rent	$114	.26	.95
Blue Shield penetration	54.5%	.41	- .25
Annual Blue Shield payments per capita	$18.05	.43	.96
Annual Medicare B allowances per capita	$23.41	.46	1.36
State medical expenditures per capita	$68.38	.56	2.38

IV. FINDINGS: ANALYSIS OF VARIANCE ON PHYSICIAN AND PRACTICE FACTORS

Table 3-4 summarizes key distribution parameters for each of the physician price index measures. The 9,827 physicians represented in the combined Blue Shield and Medicare Part B experience bases had a mean aggregate price index (AGINDEX) of 98.6. Looking at the component lines of business separately, the 8,322 physicians with Blue Shield claims experience had a mean Blue Shield price index (BSINDEX) of 96.2; and the 9,102 physicians represented in the Medicare portion of the claims experience base had a mean Medicare B price index (MBINDEX) of 100.5. An index value of 100.0 would indicate a physician whose prices average to the statewide average prices for the mix of services he performs.

Since the mean BSINDEX and AGINDEX values are less than 100.0, this may suggest that physicians with relatively higher price levels in the Blue Shield and aggregate markets tend to be those who also deliver relatively higher volumes of services in their Blue Shield and aggregate experience. This is inferred from the fact that the individual physician

TABLE 3-4. STATISTICAL PARAMETERS OF PRICE INDEX DISTRIBUTIONS

	Blue Shield (BSINDEX)	Medicare B (MBINDEX)	Aggregate (AGINDEX)
Sample Mean	96.2	100.5	98.6
Coefficient of Variation	0.27	0.29	0.28
Skewness	1.03	1.20	1.16
Kurtosis	2.22	2.12	2.22

price index calculations are weighted to reflect relative volumes of services, whereas the mean indexes reported above are simple arithmetic means over all physicians represented for a given line of business. By the same reasoning, the mean MBINDEX being very near 100.0 would suggest no particularly significant bias for either higher or lower volume physicians to be higher priced under Medicare.

The coefficients of variation shown in Table 3-4, ranging from 0.27 to 0.29, indicate substantial but not unusual dispersion in relative price levels between different physicians. The skewness measures, being positive and moderately large, indicate greater concentrations of physicians at relatively lower price levels, with the principal deviations being a comparatively small number of physicians with significantly higher prices. This again is consistent with the observation of mean AGINDEX and BSINDEX values less than 100.0. The skewness for MBINDEX is particularly large, indicating especially extreme deviations on the high side of the Medicare price distribution. The moderately large and positive kurtosis measures indicate distributions having large and tight concentrations of physicians who have price levels near the means. In graphic form, this would exhibit as distribution curves with tall and narrow peaks in comparison to a normal distribution.

Table 3-5 shows relative price level distributions for each line of business in terms of quintiles. It can be seen that 60 percent of physicians, as represented by the first three quintiles for each line of business (including aggregate), have price levels approximately equal to or less than statewide average prices. Only 40 percent have average price levels equalling or exceeding the statewide averages. The lowest priced

TABLE 3-5. PHYSICIAN PRICE INDEX QUINTILES, BY LINE OF BUSINESS

Quintile	Quintile Range: Blue Shield (BSINDEX)	Medicare B (MBINDEX)	Aggregate (AGINDEX)
Q1	≤75.30	≤76.82	≤76.61
Q2	75.31 - 86.88	76.83 - 89.60	76.62 - 88.64
Q3	86.89 - 99.05	89.61 - 101.06	88.65 - 100.13
Q4	99.06 - 117.02	101.07 - 121.14	100.14 - 118.19
Q5	≥117.03	≥121.15	≥118.20

20 percent in each line of business are at price levels at or below approximately three-fourths of statewide average price levels, while the highest priced 20 percent have price levels exceeding statewide average prices by at least 17 percent for Blue Shield and by at least 21 percent for Medicare. The highest priced physicians in each line of business have prices ranging up to more than double the statewide averages.

A. PRICE VARIATION ASSOCIATED WITH BASIC PHYSICIAN CHARACTERISTICS

1. Variation Within Lines of Business (Market Segments)

Tables 3-6(a) through (c) display comparative average price index data for physician cohort breakdowns on a number of nominal physician characteristics. Table 3-6(a) shows average relative price levels in the aggregate physicians' services market defined by the combination of Medicare Part B and private Blue Shield in Pennsylvania.

TABLE 3-6(a). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS' SERVICES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variables/Breakdown	AGINDEX	ETA-SQUARED*
Broad Specialty Cohort:		.111
General/Family Practice	86.1	
Medical Specialties	105.0	
Surgical Specialties	105.1	
Other Specialties	107.9	
Selected Specific Specialties:		.178
General Practice	85.3	
Family Practice	88.3	
General Surgery	98.9	
Internal Medicine	103.4	
Obstetrics-Gynecology	108.8	
Pediatrics	85.2	
Physician Degree:		.000*
M.D.	98.7	
D.O.	98.1	
Board Certification:		.059
Yes	106.4	
No	92.9	
Medical Education		.008
U.S. Medical School	97.8	
Foreign Medical Graduate (FMG)	105.7	
National Professional Association:		.015
AMA or AOA Member	96.8	
Non-member	104.8	

*Association of AGINDEX with physician degree is not statistically significant (significance = .498). All other listed breakdown variables are significant with AGINDEX at the .001 level.

TABLE 3-6(a). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS' SERVICES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variables/Breakdown	AGINDEX	ETA-SQUARED*
Blue Shield Participation:		.007
Yes	97.8	
No	104.5	
Medicare Assignment Acceptance:		.034
Seldom (0-20% of Line Items)	95.4	
Sometimes	97.5	
Usually (81-100%)	108.7	
Number of Physician Associates:		.037
None (solo)	96.7	
1-3	104.8	
4-14	105.4	
15 or more	118.8	
Physician's Age Decile:		.047
(1) Age 35 or less	111.2	
(2) 36-40	103.4	
(3) 41-44	100.7	
(4) 45-48	100.7	
(5) 49-51	98.6	
(6) 52-55	97.8	
(7) 56-59	96.3	
(8) 60-63	94.8	
(9) 64-68	92.5	
(10) 69 or older	88.4	

*See note on first page of this table.

TABLE 3-6(b). MEAN BLUE SHIELD PRICE INDEXES FOR PHYSICIANS' SERVICES, BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	BSINDEX	ETA-SQUARED*
Broad Specialty Cohort:		.058
General/Family Practice	86.6	
Medical Specialties	101.3	
Surgical Specialties	99.4	
Other Specialties	99.3	
Selected Specific Specialties:		.105
General Practice	86.1	
Family Practice	87.6	
General Surgery	97.7	
Internal Medicine	100.3	
Obstetrics-Gynecology	102.6	
Pediatrics	85.7	
Physician Degree:		.010
M.D.	95.3	
D.O.	104.0	
Board Certification:		.017
Yes	99.9	
No	93.1	
Medical Education:		.007
U.S. Medical School	95.4	
Foreign Medical Graduate (FMG)	102.0	
National Professional Association:		.025
AMA or AOA Member	94.0	
Non-member	104.0	
Blue Shield Participation:		.003
Yes	95.6	
No	100.1	

* All Listed breakdown variables with BSINDEX are significant at the .001 level.

TABLE 3-6(b). MEAN BLUE SHIELD PRICE INDEXES FOR PHYSICIANS' SERVICES, BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	BSINDEX	ETA-SQUARED*
Medicare Assignment Acceptance:		.037
Seldom (0-20% of Line Items)	93.2	
Sometimes (21-80%)	93.5	
Usually (81-100%)	105.1	
Number of Physician Associates:		.038
None (solo)	94.5	
1-3	101.5	
4-14	100.9	
15 or more	115.4	
Physician's Age Decile:		.059
(1) Age 35 or less	110.2	
(2) 36-40	100.8	
(3) 41-44	99.6	
(4) 45-48	96.3	
(5) 49-51	95.1	
(6) 52-55	94.9	
(7) 56-59	92.8	
(8) 60-63	90.6	
(9) 64-68	88.7	
(10) 69 or older	83.4	

*See note on first page of this table.

TABLE 3-6(c). MEAN MEDICARE PRICE INDEXES FOR PHYSICIANS' SERVICES, BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	MBINDEX	ETA-SQUARED*
Broad Specialty Cohort:		.148
General/Family Practice	85.9	
Medical Specialties	109.4	
Surgical Specialties	108.1	
Other Specialties	113.7	
Selected Specific Specialties:		.217
General Practice	85.1	
Family Practice	88.2	
General Surgery	99.3	
Internal Medicine	104.7	
Obstetrics-Gynecology	121.5	
Physician Degree:		.001
M.D.	100.8	
D.O.	97.7	
Board Certification:		.088
Yes	111.1	
No	93.3	
Medical Education:		.007
U.S. Medical School	99.7	
Foreign Medical Graduate (FMG)	107.9	
National Professional Association:		.014
AMA or AOA Member	98.7	
Non-member	107.2	
Blue Shield Participation:		.007
Yes	99.6	
No	106.9	

* All listed breakdown variables with MBINDEX are significant at the .001 level.

TABLE 3-6(c). MEAN MEDICARE PRICE INDEXES FOR PHYSICIANS' SERVICES, BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	MBINDEX	ETA-SQUARED*
Medicare Assignment Acceptance:		.034
Seldom (0-20% of Line Items)	97.0	
Sometimes (21-80%)	99.0	
Usually (81-100%)	111.1	
Number of Physician Associates:		.033
None (solo)	98.6	
1-3	106.2	
4-14	107.1	
15 or more	122.5	
Physician's Age Decile:		.045
(1) Age 35 or less	112.6	
(2) 36-40	106.4	
(3) 41-44	105.4	
(4) 45-48	103.1	
(5) 49-51	100.4	
(6) 52-55	100.4	
(7) 56-59	99.4	
(8) 60-63	96.8	
(9) 64-68	94.0	
(10) 69 or older	89.1	

*See note on first page of this table.

Tables 3-6(b) and 3-6(c) show corresponding data on relative price levels in, respectively, the Blue Shield and Medicare Part B segments of the market. It should be noted that the BSINDEX data in the (b) table show relative price levels in the Blue Shield market only, as a closed system; and the MBINDEX data in the (c) table similarly show relative price levels for the Medicare B market as a separate closed system. Since the BSINDEX and MBINDEX data are derived from different bases, they cannot be directly compared with one another. Similarly, neither can be compared directly with AGINDEX data. The practical import of this is that direct comparisons of relative price levels shown in these tables are valid only for breakdowns contained in the same table. Comparisons between tables -- i.e., across lines of business, or between different market segments -- must be made somewhat cautiously.

In addition to comparative price index data, these tables also give eta-squared statistics and statistical significance measures for each breakdown variable. The eta-squared statistic commonly is interpreted as a measure of the proportion of variance in the dependent variable explained by the breakdown variable. Thus, the larger the value of eta-squared, the stronger the apparent association between the relative price index variable and the potential price-explanatory variable used for the breakdown.

Starting with an examination of the breakdowns by broad specialty cohort, it is quickly confirmed that generalists (including family practice physicians) have substantially lower prices than specialists. This is consistent with the expectation that specialty credentials normally translate to a perception of higher quality of care, and thus can

command higher prices. Pooling all specialists together, the aggregate average relative price premium for specialty credentials is 22.3 percent. It also can be seen that medical specialists in general tend to command the highest prices in the Blue Shield market (for comparable packages of services), but that "other" specialists have the highest relative prices under Medicare and in the aggregate. The price premium on specialty credentials is clearly much greater in the Medicare market than in the Blue Shield market. Specialists' prices average 15.8 percent higher than those of generalists in the Blue Shield market, and 22.7 percent higher in the Medicare market.

Looking at selected specific specialties, and concentrating initially upon primary care physicians, it is seen that those in pediatric practice have the lowest overall average price levels. As may be expected, family practice physicians have slightly higher prices than general practitioners; and internists in general are relatively high priced (but not extremely so), with overall price levels that on the average are approximately 21 percent higher than those of general practitioners. General surgeons tend to be quite near statewide average prices for the services they perform. Specialists in obstetrics-gynecology are particularly high priced, especially under Medicare. Although not shown among the specific specialties selected for display in Tables 3-6(a) through (c), the highest price levels tend generally to be found among some of the medical sub-specialties. Under Medicare, these include gastroenterology (MBINDEX 123.6), neurology (142.1), hematology (127.3), infectious disease (138.7), and nephrology (123.9). Under Blue Shield, the highest include specialists in infectious disease (BSINDEX

122.9), nephrology (121.3), and neonatology (123.2). Also relatively high priced in the Blue Shield market are plastic surgeons (BSINDEX 121.5). Pathologists are comparatively low priced in both market segments (BSINDEX 83.66 and MBINDEX 88.1). Radiologists are quite high under Medicare (MBINDEX 126.6), but have a more modest relative price level under Blue Shield (BSINDEX 101.2).

Overall, as indicated by the eta-squared statistics, physician speciality accounts for 10.5 percent of the variation in physician prices in the Blue Shield market, 21.7 percent of physician price variation in the Medicare market, and 17.8 percent in the aggregate market. Even when differentiating only at the level of broad specialty classes (general, medical, surgical, and other), 5.8 percent of the variation in Blue Shield prices is accounted for, with 14.8 percent of price variation accounted for at this level in the Medicare market, and 11.1 percent in the aggregate market.

On some other physician characteristics commonly associated with quality, physicians with board certification credentials have prices in the aggregate market that are 14.5 percent higher than those of physicians without such credentials. The price differential associated with board certification is particularly large in the Medicare market, with prices being 19.1 percent higher for board certified physicians. In the Blue Shield segment, the price premium for board certification averages a comparatively modest 7.3 percent. Overall, board certification status accounts for 5.9 percent of the variation in physicians' prices.

Although foreign medical graduates (FMGs) often are regarded as inferior to physicians trained in medical schools in the United States,

and therefore as delivering a lower quality of care than physicians from U.S. schools, this is not reflected in the relative price levels for FMGs. Quite the contrary, FMGs have relative price levels that are substantially higher than those of physicians from U.S. medical schools. This favorable price differential for FMGs exists in both the Blue Shield and Medicare market segments, and averages 8.1 percent in the aggregate.

With respect to the physician's degree, Doctors of Medicine (M.D.) have prices in the Medicare market that are 3.1 percent higher than those of Doctors of Osteopathy (D.O.). On the other hand, D.O. prices are 9.1 percent higher than M.D. prices in the Blue Shield market. In the aggregate market, the price difference between M.D. and D.O. physicians balances out and is not significant.

In spite of the price differences noted here, neither the physician's degree nor FMG status account for any appreciable proportion of the overall variation in physicians' prices. This is primarily due to the fact that FMGs and osteopathic physicians both comprise relatively small proportions of the overall physician population.

Turning to some of the physician's affiliations, those who are members of their national professional association (American Medical Association or American Osteopathic Association) have prices approximately 7.6 percent lower than non-members. Further, those who participate with Blue Shield have prices in the aggregate that are 6.4 percent lower than non-participating doctors' prices. Interestingly, the price difference associated with Blue Shield participation status is larger in the Medicare market segment than in the Blue Shield segment. In the Medicare market, assignment acceptance is analogous to participation status in the Blue

Shield market. Unlike the all-or-nothing option for Blue Shield participation, however, a physician may exercise the Medicare assignment option on a case by case basis. Those who consistently take assignment have prices that are approximately 14 percent higher than the prices of those who consistently decline assignment. It is interesting to note that the relationship of price to Medicare assignment acceptance is exactly opposite the relationship of price to Blue Shield participation. If consistent acceptance of assignment may be likened to Medicare "participation," then it is the higher priced doctor who tends to participate in Medicare, but it also is the higher priced doctor who tends not to participate in Blue Shield.

In terms of the number of professional associates with whom a physician practices, the general tendency is for those appearing as solo practitioners to have the lowest prices, with the physician's relative price level increasing as the number of his professional associates grows larger. Compared to solo practitioners, those with fifteen or more associates have prices that are in the range of 22 to 24 percent higher, depending upon the specific market segment. In the aggregate, the number of physician associates accounts for 3.7 percent of the variation in physicians' prices.

Finally, the physician's age is seen to have a rather substantial relationship to relative price levels. In the aggregate market, the physician's age group (in deciles) accounts for 4.7 percent of the variation in physician prices, with the youngest ten percent having prices approximately 26 percent higher than the prices of the oldest ten percent. The age-associated difference in relative price levels is most

particularly pronounced in the Blue Shield market, where there is a 32 percent difference in average price levels between the youngest and the oldest deciles, with the younger physicians being more expensive.

2. Variation Within Broad Specialty Groupings

Tables 3-7(a) through (d) show comparative average price index data for a number of breakdowns by nominal physician characteristics similar to those in the preceding Table 3-6 series, but with the breakdowns controlled for broad specialty classes. Specifically, Table 3-7(a) shows findings for general and family practice physicians only; Table 3-7(b) shows findings for medical specialists only; Table 3-7(c) shows findings for surgical specialists; and Table 3-7(d) shows findings for other specialists. Since the data in all four tables are aggregate price relatives (AGINDEX), it is in this case valid to make direct comparisons horizontally between tables -- i.e., between different specialty groups -- as well as vertically within tables. As before, eta-squared statistics and statistical significance measures also are given.

The breakdowns by physician degree show that higher aggregate price levels for D.O. physicians, as compared to M.D. physicians, hold through all of the broad specialty cohorts except the "other specialties" group. The result for "other" specialists, however, is not statistically significant. The difference is greatest among generalists, where D.O. prices are 12.4 percent higher than M.D. prices and the physician's degree accounts for 5.4 percent of the variation in prices. Comparing between tables, it also can be seen that medical and surgical specialists

TABLE 3-7(a). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN GENERAL AND FAMILY PRACTICE BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician Degree:		.054
M.D.	83.6	
D.O.	94.0	
Board Certification:		.003
Yes	89.2	
No	85.7	
Medical Education:		.001*
U.S. Medical School	85.9	
Foreign Medical Graduate (FMG)	87.8	
National Professional Association:		.008
AMA or AOA Member	85.2	
Non-member	89.4	
Blue Shield Participation:		.001
Yes	85.8	
No	89.0	
Medicare Assignment Acceptance:		.036
Seldom (0-20% of Line Items)	84.9	
Sometimes (21-80%)	84.6	
Usually (81-100%)	96.3	
Number of Physician Associates:		.011
None (solo)	85.6	
1-3	90.0	
4-14	94.5	
15 or more	99.0	

* Association of the Medical Education factor with AGINDEX is not statistically significant (significance = .179). All other listed breakdown variables are significant at the .001 level.

TABLE 3-7(a). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN GENERAL AND FAMILY PRACTICE BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician's Age Decile:		.078
(1) Age 35 or less	99.4	
(2) 36-40	89.9	
(3) 41-44	89.4	
(4) 45-48	88.6	
(5) 49-51	87.1	
(6) 52-55	86.3	
(7) 56-59	83.9	
(8) 60-63	83.3	
(9) 64-68	80.2	
(10) 69 or older	79.6	

*See note of first page of this table.

TABLE 3-7(b). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN MEDICAL SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician Degree:		.001*
M.D.	104.9	
D.O.	109.3	
Board Certification:		.015
Yes	108.5	
No	101.5	
Medical Education:		.009
U.S. Medical School	104.0	
Foreign Medical Graduate (FMG)	112.5	
National Professional Association:		.022
AMA or AOA Member	102.3	
Non-member	111.7	
Blue Shield Participation:		.002
Yes	104.5	
No	109.1	
Medicare Assignment Acceptance:		.086
Seldom (0-20% of line items)	98.4	
Sometimes (21-80%)	105.4	
Usually (81-100%)	119.6	
Number of Physician Associates:		.056
None (solo)	102.1	
1-3	110.0	
4-14	105.9	
15 or more	124.7	

* Association of the Physician Degree factor with AGINDEX is not statistically significant (significance = .123). All other listed breakdown variables are significant at the .001 level.

TABLE 3-7(b). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN MEDICAL SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician's Age Decile:		.080
(1) Age 35 or less	120.7	
(2) 36-40	108.0	
(3) 41-44	110.3	
(4) 45-48	107.1	
(5) 49-51	105.8	
(6) 52-55	102.3	
(7) 56-59	102.6	
(8) 60-63	98.2	
(9) 64-68	98.0	
(10) 69 or older	89.0	

*See note on first page of this table.

TABLE 3-7(c). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN SURGICAL SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician Degree:		.002
M.D.	104.8	
D.O.	110.8	
Board Certification:		.013
Yes	107.5	
No	100.5	
Medical Education:		.001
U.S. Medical School	104.7	
Foreign Medical Graduate (FMG)	107.9	
National Professional Association:		.013
AMA or AOA Member	103.5	
Non-member	111.6	
Blue Shield Participation:		.002
Yes	104.4	
No	108.1	
Medicare Assignment Acceptance:		.002
Seldom (0-21% of line items)	105.5	
Sometimes (21-80%)	103.5	
Usually (81-100%)	106.6	
Number of Physician Associates:		.012
None (solo)	103.8	
1-3	108.5	
4-14	112.8	
15 or more	114.7	

* Association of Medicare Assignment Acceptance with AGINDEX is not sigificant at the .05 level (significance = .061). The Medical Education factor is significant at the .05 level (significance = .038). All other listed breakdown variables are significant at the .001 level.

TABLE 3-7(c). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN SURGICAL SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	AGINDEX	ETA-SQUARED*
Physician's Age Decile:		.008
(1) Age 35 or less	110.3	
(2) 36-40	106.9	
(3) 41-44	106.7	
(4) 45-48	107.3	
(5) 49-51	103.2	
(6) 52-55	105.3	
(7) 56-59	104.2	
(8) 60-63	102.9	
(9) 64-68	104.3	
(10) 69 or older	99.2	

*See note on first page of this table.

TABLE 3-7(d). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN OTHER SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS

Variable/Breakdown	AGINDEX	ETA-SQUARED	SIG.
Physician Degree:		.002	.271
M.D.	107.2		
D.O	102.4		
Board Certification:		.009	.026
Yes	109.1		
No	103.1		
Medical Education:		.006	.086
U.S. Medical School	105.7		
Foreign Medical Graduate (FMG)	111.7		
National Professional Association:		.009	.025
AMA or AOA Member	105.1		
Non-member	112.1		
Blue Shield Participation:		.001	.469
Yes	106.3		
No	108.8		
Medicare Assignment Acceptance:		.004	.319
Seldom (0-20% of line items)	104.5		
Sometimes (21-80%)	109.2		
Usually (81-100%)	107.3		
Number of Physician Associates:		.002	.852
Non (solo)	106.9		
1-3	107.9		
4-14	103.3		
15 or more	101.9		

TABLE 3-7(d). MEAN AGGREGATE PRICE INDEXES FOR PHYSICIANS IN OTHER SPECIALTIES BY SELECTED PHYSICIAN CHARACTERISTIC BREAKDOWNS (Cont'd)

Variable/Breakdown	AGINDEX	ETA-SQUARED	SIG.
Physician's Age Decile:		.032	.046
(1) Age 35 or less	119.7		
(2) 36-40	113.1		
(3) 41-44	102.8		
(4) 45-48	102.1		
(5) 49-51	107.8		
(6) 52-55	105.7		
(7) 56-59	105.7		
(8) 60-63	107.4		
(9) 64-68	98.4		
(10) 69 or older	103.6		

have the highest price levels among D.O. physicians, while "other" specialists are highest among M.D. physicians.

Board certification credentials are held by 10.4 percent of general and family practice physicians, 50.7 percent of medical specialists, 65.5 percent of surgical specialists, and 61.2 percent of other specialists. This type of credentialing is associated with higher relative price levels in all specialty cohorts. The price premium for board certification ranges from 4.1 percent for generalists to 10.7 percent for surgical specialists. Higher price levels for FMGs, as compared to physicians graduated from U.S. medical schools, similarly hold across all broad specialty cohorts. Since only 19.6 percent of FMGs are in general and family practice, compared to 35.9 percent of U.S. medical school graduates, it might be conjectured that the comparatively higher price levels observed for FMGs could be explained by the relatively greater concentration of specialists among them. The findings shown in the table, however, refute that argument. FMGs tend to be the highest priced physicians in all specialty groups. The price gap in favor of FMGs is smallest among generalist physicians (2.2 percent) and largest among medical specialists (8.5 percent).

Generalists who are members of their national professional association have prices 4.7 percent lower than non-members. Among specialists, national association members have prices in the range of 6 to 8 percent lower than non-members. Physicians who participate with Blue Shield have prices generally in the neighborhood of 4 percent lower than nonparticipating doctors in all specialty cohorts (except for "other" specialties, where the gap is closer to 2 percent, but not statistically

significant). Conversely, physicians who consistently accept assignment on Medicare have prices that are higher in all specialty cohorts than the prices of physicians who consistently do not take assignment. The magnitude of the price differential associated with Medicare assignment acceptance varies considerably between different specialty groups. Among generalists, doctors who usually take assignment have prices 13.4 percent higher than those who seldom take assignment, compared to corresponding differences of 21.5 percent among medical specialists and a mere 1.0 percent among surgical specialists. Again, the result for other specialists is not significant. The result for surgical specialists also is significant only at a relatively low level.

Physicians who practice with greater numbers of associates rather uniformly tend to have higher prices in all specialty cohorts. Generalists practicing in groups of more than fifteen have prices averaging 15.7 percent higher than the prices of solo generalists. Medical and surgical specialists practicing in large groups (15 or more associates) have prices that respectively are 22.1 percent and 10.5 percent higher than the prices of their solo counterparts. The results for other specialists are mixed and not statistically significant.

The tendency for younger physicians to have higher prices also holds uniformly through all specialty cohorts. Again, however, the magnitude of the effect varies from one specialty group to another. The gap by which the youngest physicians' prices exceed those of the oldest is 24.9 percent among generalists, 35.6 percent among medical specialists, and 11.2 percent for surgical specialists. The result for other specialists is not statistically significant.

Summarizing briefly for each cohort, 5.4 percent of the price variance among general and family practice physicians is explained by the physician's degree; 3.6 percent of the variance is associated with Medicare assignment acceptance rates; and 7.8 percent is explained by the physician's age group. Higher price levels for generalists are associated with D.O. degrees, high rates of Medicare assignment acceptance, and younger physicians. None of the other potential explanatory factors shows any meaningful level of statistical association with the aggregate price variable, although interesting patterns of price variation may be exhibited in some of their breakdowns.

In the medical specialist cohort, board certification credentials explain a relatively modest 1.5 percent of the variance in medical specialists' prices; national professional association membership explains 2.2 percent; Medicare assignment acceptance is associated with 8.6 percent; the number of physician associates explains 5.6 percent; and the physician's age group explains 8.0 percent. Higher price levels are associated with board certification, non-membership in the national association, high rates of Medicare assignment acceptance, greater numbers of professional associates, and younger age groups. FMG status, while associated with substantially higher relative price levels, explains little of the overall variation in medical specialists' prices, due primarily to the fact that FMGs comprise only a relatively small proportion (11.9 percent) of all medical specialists sampled. The medical specialist's degree and Blue Shield participation status show insignificant or negligible statistical association with price.

The nominal physician characteristics broken down in these tables tend generally to explain very little of the variance in prices among surgical specialists. Board certification and national association membership each explain 1.3 percent of the variance; and the number of physician associates explains 1.2 percent. Higher prices are associated with board certification, non-membership in the national association, and greater numbers of associates. Again, some interesting patterns of price variation may be observed in the breakdowns for certain other physician characteristics, but the associations are statistically weak.

For other specialists, only board certification, national association membership, and the physician's age group are significant at the .05 level. The physician's age explains 3.2 percent of the variance in other specialists' prices. Board certification and national association membership each explain less than 1.0 percent. The low level of explanatory power for these nominal physician characteristic factors among other specialists may be attributed largely to the "catch-all" nature of this specialty grouping, which contains such diverse types as pathologists, radiologists, anesthesiologists, psychiatrists, and specialists in physical medicine and rehabilitation, among others. The statistical significance problem also is made more difficult by the fact that this is by far the smallest cohort, comprising only 5.7 percent of the sample population.

B. PRACTICE CHARACTERISTICS

This subsection examines the association of physicians' relative prices with a group of variables providing a summary picture of the physician's practice activity. The general activity level in the practice is measured in terms of three different variables: the size of the physician's active patient roster, the total number of services delivered, and gross dollar value of billings during the course of the data base year (1975). These measures, of course, are available to this study only for Pennsylvania physicians' Blue Shield and Medicare Part B activity. Uninsured or otherwise insured activity is not reflected. In addition, a price-adjusted mean unit charge per service is used as an indicator of whether the physician typically deals in intrinsically higher-valued or intrinsically lower-valued types of services. This variable is obtained for each physician by dividing his raw mean charge per service by the price index representing his cross-sectional relative price position compared to other doctors who perform the same services. The resulting adjusted mean unit charge per service is very much analogous to an average Relative Value for the mix of services a physician performs. The mean annual number of services per patient also has been calculated, and is used here as a variable characterizing the intensity of services delivered relative to a physician's patient load. For collections of physicians who deal in similar kinds of services, a comparatively high value on this variable could suggest a physician who might be overutilizing. All of the above practice variables have been developed separately for each physician's Blue Shield experience and Medicare Part B experience, as well

as for the aggregate of the combined Blue Shield and Medicare experience. Finally, two additional variables describe the relative proportion of the physician's active patient roster covered under Medicare and the relative proportion of Blue Shield claim line items covered under usual, customary, and reasonable (UCR) methods of reimbursement.

1. Variation Within Lines of Business (Market Segments)

With the physician population partitioned into quintiles based upon each of the relative price index measures (AGINDEX, BSINDEX, and MBINDEX), Tables 3-8(a) through (c) display mean practice characteristics for physicians in each relative price quintile in each market segment and in aggregate. Table 3-8(a) shows the distribution of mean practice characteristics over the price-based physician quintiles for the aggregate market; Table 3-8(b) shows corresponding distributions for the Blue Shield market; and Table 3-8(c) shows the distributions for the Medicare B market. The first quintile (Q1) shown in these tables corresponds to the lowest priced 20 percent of the physician population in each market, and the fifth quintile (Q5) corresponds to the highest, with intervening quintiles representing a steady progression from lower to higher relative price levels. Each table also displays eta-squared statistics to indicate the general strength of bivariate statistical association of each practice characteristic variable with the quintile breakdown of each price index variable. Data may validly be compared from table to table in this set.

TABLE 3-8(a). MEAN PRACTICE CHARACTERISTICS, BY AGGREGATE PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
No. of Blue Shield patients seen	88	123	147	167	118	.015	
No. of Medicare patients seen	93	113	132	131	129	.012	
Total number of different patients seen	181	235	279	299	247	.018	
Percent of patients Medicare	63.4%	59.8%	59.1%	51.7%	57.8%	.014	
Annual number of Blue Shield services	330	448	506	565	442	.012	
Annual number of Medicare services	1,011	1,125	1,110	1,093	857	.006	
Aggregate annual number of services	1,179	1,428	1,485	1,501	1,181	.007	
Total annual Blue Shield billings	$ 9,884	$14,368	$18,212	$23,625	$22,475	.036	
Total annual Medicare B billings	$11,153	$15,083	$18,069	$20,854	$23,306	.034	
Aggregate total annual billings	$18,015	$26,203	$32,686	$39,975	$41,120	.045	
Adj. mean unit chg. per Blue Shield svc.	$48.14	$51.09	$56.67	$61.10	$62.23	.006	
Adj. mean unit chg. per Medicare B svc.	$23.01	$23.23	$24.43	$26.94	$27.16	.003	
Adj. mean aggregate unit chg. per svc.	$30.89	$34.51	$36.34	$43.44	$40.14	.006	
Mean annual svcs. per Blue Shield patient	3.52	3.37	3.19	3.26	3.38	.002	.011
Mean annual svcs. per Medicare B patient	9.91	9.14	8.01	7.41	6.20	.044	
Aggregate mean annual svcs. per patient	7.81	7.11	6.26	5.62	5.03	.039	
Percent Blue Shield line items on UCR	71.6%	70.0%	68.4%	65.3%	59.2%	.048	

* Statistical associations are significant at the .001 level unless shown otherwise.

TABLE 3-8(b). MEAN PRACTICE CHARACTERISTICS, BY BLUE SHIELD PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (BSINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Number of Blue Shield patients seen	131	182	205	196	153	.013	
Number of Medicare patients seen	125	148	150	140	130	.005	
Total number of different patients seen	256	329	354	337	282	.013	
Percent of patients Medicare	51.6%	48.8%	47.4%	43.9%	46.9%	.008	
Annual number of Blue Shield services	441	578	662	664	564	.011	
Annual number of Medicare services	1,332	1,368	1,335	1,337	1,174	.002	.016
Aggregate annual number of services	1,579	1,793	1,856	1,809	1,595	.004	
Total annual Blue Shield billings	$12,782	$19,720	$24,344	$27,404	$26,820	.036	
Total annual Medicare B billings	$16,442	$21,264	$22,691	$25,095	$28,232	.024	
Aggregate total annual billings	$26,258	$37,932	$43,709	$48,035	$50,662	.038	
Adj. mean unit chg. per Blue Shield svc.	$50.02	$56.88	$58.43	$61.37	$53.43	.003	.001
Adj. mean unit chg. per Medicare B svc.	$25.50	$28.33	$27.71	$29.17	$28.24	.001	.088
Adj. mean aggregate unit chg. per svc.	$34.76	$43.00	$44.51	$48.69	$42.86	.007	
Mean annual svcs. per Blue Shield patient	3.98	3.71	3.38	3.43	3.94	.008	
Mean annual svcs. per Medicare B patient	9.64	8.46	8.28	7.89	7.72	.012	
Aggregate mean annual svcs. per patient	7.00	6.26	5.97	5.67	5.91	.010	
Percent Blue Shield line items on UCR	71.0%	69.6%	68.1%	64.6%	59.6%	.058	

*Statistical associations are significant at the .001 level unless shown otherwise.

TABLE 3-8(c). MEAN PRACTICE CHARACTERISTICS, BY MEDICARE B PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (MBINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Number of Blue Shield patients seen	86	107	127	149	161	.015	
Number of Medicare patients seen	102	121	137	135	151	.015	
Total number of different patients seen	188	228	264	285	312	.021	
Percent of patients Medicare	68.8%	65.3%	62.8%	59.3%	57.1%	.021	
Annual number of Blue Shield services	333	419	448	550	521	.011	
Annual number of Medicare services	1,032	1,201	1,176	1,067	923	.005	
Aggregate annual number of services	1,262	1,512	1,534	1,496	1,342	.004	
Total annual Blue Shield billings	$10,392	$12,463	$16,479	$20,935	$26,066	.045	
Total annual Medicare B billings	$11,377	$15,831	$18,802	$20,362	$26,066	.042	
Aggregate total annual billings	$19,201	$25,682	$31,982	$37,402	$47,955	.055	
Adj. mean unit chg. per Blue Shield svc.	$45.80	$43.82	$48.42	$53.74	$68.37	.019	
Adj. mean unit chg. per Medicare B svc.	$23.20	$23.13	$23.58	$26.18	$28.73	.004	
Adj. mean aggregate unit chg. per svc.	$28.97	$28.82	$30.85	$35.86	$42.60	.011	
Mean annual svcs. per Blue Shield patient	3.52	3.44	3.36	3.26	3.33	.001	.100
Mean annual svcs. per Medicare B patient	10.09	9.59	8.46	7.51	6.07	.053	
Aggregate mean annual svcs. per patient	8.24	7.62	6.65	5.80	4.93	.052	
Percent Blue Shield line items on UCR	72.1%	70.1%	68.2%	65.2%	58.7%	.052	

*Statistical associations are significant at the .001 level unless shown otherwise.

The variables and data presented in these tables were developed with the expectation that their analysis might yield some interesting and potentially useful answers and insights in relation to questions such as the following:

- o Which, if any, of the measured practice characteristics have appreciable and significant levels of statistical association with physicians' relative price levels?
- o What is the relative importance of the various practice characteristics in relation to the physician's effective price position?
- o Do the various practice characteristics differ in the patterns of their apparent effects between the two market segments examined here?
- o Segregating practice activity into Blue Shield and Medicare components, does the activity in either one of these market segments appear to have a dominating influence upon the physician's overall relative price position?
- o Does either market segment appear to be more susceptible than the other to practice activity influences upon relative price positioning?
- o Are there any cross-over influences between market segments -- i.e., does Blue Shield practice activity appear to influence price positioning in the Medicare market, and/or vice versa?

In reviewing the results in Tables 3-8(a) through (c), one of the more striking things about the findings is that, as measured by the eta-squared statistics, very few of the practice variables exhibit any substantial association with physicians' relative price levels. These findings are supported and reinforced by Pearson correlation measures calculated for the same data set (not displayed here). The Pearson correlations tended to be quite small on the whole -- many of them very small -- with approximately one-fourth of the pairwise associations between practice variables and price index variables failing to achieve statistical significance at the .05 level. These generally low levels of statistical association are somewhat surprising, and perhaps even disappointing, if one believes or suspects that price levels for physicians' services should, or may, somehow be related to these kinds of practice activity and service intensity factors.

Each type of practice factor considered here is discussed briefly below, summarizing the observed associations and relationships of the practice factors with the relative price level breakdowns in each market.

Size of Active Patient Roster. There is a modest degree of association between relative price level and the number of distinctly different patients seen by a physician during the course of the data base year. The eta-squared statistics generally indicate approximately one to two percent of the variance in active patient roster sizes to be associated with the relative price level breakdowns. In the Medicare and aggregate

markets, the relationship between price and patient roster size is positive -- i.e., larger patient rosters are associated with higher physician price levels. This relationship breaks slightly, however, for the highest priced 20 percent of physicians in the aggregate market. In the Blue Shield market, the physicians with the largest active patient rosters tend to be in the mid-range of the price distribution, with both the highest and the lowest priced physicians having comparatively smaller active patient rosters.

Percent of Active Patient Roster Covered by Medicare. It could be hypothesized that the proportion of a physician's patients covered under Medicare may have some bearing upon his price decisions, particularly for services delivered in the Medicare segment of the market. If so, however, it is not entirely clear whether the a priori expectation should be for a positive or a negative relationship. The findings here indicate that 2.1 percent of the variance in proportion of patients covered under Medicare is associated with relative price level in the Medicare market, with a slightly smaller level of association observed in the aggregate market. The relationship tends to be negative, with larger proportions of Medicare patients being associated with lower relative prices in the Medicare and aggregate markets. The association between proportion of patients covered under Medicare and relative price levels in the Blue Shield market is negligible.

Annual Volume of Services Delivered. Blue Shield service volumes appear to have some small relationship to relative price levels in each of the markets studied. The relationship tends to be positive, with higher service volumes being associated with higher relative price levels, but breaks somewhat for the highest priced quintile of physicians in each market. Approximately one percent of the variance in Blue Shield services volume is associated with the price variable in each market. Medicare and aggregate service volumes display no substantial relationship with relative price levels in any market.

Annual Dollar Volume of Billings. The size of a physician's practice, as measured by the gross dollar value of its annual billings, appears to have a relatively strong relationship with the physician's relative price level in each market. This may be deceiving, however, if it seems to suggest that the relative dollar volume of billings may be one of the determinants of relative price levels charged in a practice. A causal relationship, in fact, clearly exists in the opposite direction, with a physician's relative price level being one of the determinants of the practice's annual dollar volume. If the annual volume of billings is adjusted by dividing it by the physician's relative price index for the same market, this relative price-related influence is removed and a more true measure of the association between prices and gross dollar volume in a practice can be obtained. With annual billings thus

adjusted, the price and dollar volume variables were found to be very poorly related, with eta-squared uniformly falling into the range of .001 to .010.

Price-Adjusted Mean Unit Value of Services Delivered. The mean unit value, or intrinsic value, of services delivered in a practice has a generally positive relationship to relative price positioning. That is, physicians who deal primarily in intrinsically higher valued types of services tend to charge somewhat higher prices for those services they deliver in common with other physicians who deal primarily in intrinsically lower valued services. This relationship breaks somewhat for the highest priced physician quintile in the Blue Shield market, and also for the lowest priced physician quintile in the Medicare market. The strength of the association of this factor with price is practically negligible, however, except in the case of the intrinsic valuation of a physician's Blue Shield and aggregate services in relation to his prices in the Medicare market. Here, one to two percent of the variance in intrinsic valuation of Blue Shield and aggregate services performed is associated with variations in Medicare relative price levels.

Intensity of Services per Patient. Relative price levels in the Blue Shield market are little affected by service intensity factors; and, conversely, intensity of Blue Shield services delivered per Blue Shield subscriber has negligible

relationship with the price level variable in all markets. On the other hand, the intensity of Medicare services and the aggregate intensity of services both are fairly strongly related to relative price levels in both the Medicare and aggregate markets. The relationship is negative, or downward sloping, indicating that higher priced physicians deliver fewer services per patient, and lower priced physicians deliver more services per patient. Approximately four percent of the variance in Medicare and aggregate services intensity is associated with relative price level in the aggregate market, and approximately five percent in the Medicare market.

Proportion of Claim Line Items Reimbursed Under UCR.

The findings indicate a negative relationship between the proportion of a physician's Blue Shield claims reimbursed under UCR and his relative price levels in all markets. Thus, higher proportions of UCR business in the practice are associated with lower price levels, which is contrary to popular expectation. Actually, the inverse relationship of this factor to price is relatively strong, with eta-squared of .058 in the Blue Shield market, .052 in the Medicare market, and .048 in the aggregate market. The result is in part explained by the fact that, in the Philadelphia area, a relatively small proportion of Pennsylvania Blue Shield contracts are for UCR reimbursement. This area, however, also happens to be a comparatively high priced geographic area for medical services and has a very large share of the

state's physicians. Nevertheless, if Philadelphia County is omitted from the analysis, the negative relationship persists. Higher proportions of Blue Shield claims under UCR still are associated with lower relative price levels in all markets throughout the remainder of the state; but without Philadelphia, the eta-squared statistics drop to the neighborhood of .013 to .017.

On the whole, from among the practice variables considered here, intensity of services per patient appears to be the most important price-related variable, except in relation to the Blue Shield market segment. The size of the physician's active patient roster is slightly (but very slightly) related to price in all markets, while the percentage of the physician's patients covered under Medicare has a similar level of relationship to price in the Medicare and aggregate markets only. The proportion of a physician's Blue Shield claims reimbursed under UCR is strongly related to relative price levels if Philadelphia is included in the analysis, and still is related -- at least marginally -- if Philadelphia is excluded. In general, greater intensity of services is associated with lower prices; larger active patient rosters are associated with higher prices; greater proportions of Medicare patients are associated with lower Medicare and aggregate prices; and greater proportions of Blue Shield claims reimbursed under UCR are associated with lower prices. All of the other practice factors considered here appear to be of negligible importance in relation to physicians' relative price positions.

Further generalizations from these findings may be a bit difficult and tenuous. Nevertheless, the following thoughts are suggested:

- Regarding the influence which practice factors in given markets may have on relative price levels:
  - (a) Blue Shield practice factors have very little relationship to price levels, and apparently very little influence upon price determination, in any market.
  - (b) Medicare practice factors have a slight impact upon prices in the Medicare market itself, with some carry-over into the aggregate market.
  - (c) Aggregate practice factors also have some relationship to relative prices, mainly in the Medicare market, with carry-over into the aggregate market.

- Regarding the receptivity of given markets to show a relationship of prices in the market to various practice factors.
  - (a) Prices in the Blue Shield market are almost negligibly affected by practice factors. To the extent that there is any effect here, it is slight and relates mainly to Blue Shield and aggregate practice factors.
  - (b) Prices in the Medicare market relate principally to aggregate practice factors, with Medicare practice

factors also having some degree of relationship.

(c) Prices in the aggregate market are related most strongly to aggregate practice factors, but also are related to some degree to Medicare practice factors.

o Regarding cross-over effects between markets:

(a) Blue Shield practice factors have a very mild, hardly significant, relation with Medicare prices.

(b) Medicare practice factors have a nearly negligible relationship with Blue Shield prices.

(c) In the aggregate market, relative price levels are more strongly related to Medicare practice factors than to Blue Shield practice factors.

2. Variation Within Broad Specialty Groupings

Tables 3-9(a) through (d) display data similar to that found in Table 3-8(a), but controlled for broad specialty classes. The data shown are mean aggregate practice characteristics for physicians in each relative price quintile in the aggregate market for Blue Shield and Medicare Part B. Again, eta-squared statistics and statistical significance measures are reported, and can be interpreted as before. Table 3-9(a) displays findings for the cohort of general and family practice physicians; Table 3-9(b) displays findings for medical specialists only; Table 3-9(c) displays findings for surgical specialists; and Table 3-9(d) displays findings for other specialists. Data may validly be compared between tables in this set.

TABLE 3-9(a). MEAN PRACTICE CHARACTERISTICS OF GENERAL AND FAMILY PRACTICE PHYSICIANS, BY AGGREGATE PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Total number of different patients seen	148	172	175	193	154	.010	
Percent of patients Medicare	73.0%	70.2%	69.1%	62.7%	59.7%	.021	
Aggregate annual number of services	1,270	1,445	1,481	1,668	1,359	.007	
Aggregate total annual billings	$11,303	$14,407	$15,957	$20,140	$21,565	.037	
Adj. mean aggregate unit chg. per svc.	$13.29	$12.26	$11.50	$11.74	$12.97	.014	
Aggregate mean annual svcs. per patient	9.44	8.88	8.66	8.52	8.71	.005	.005
Percent Blue Shield line items on UCR	74.9%	71.8%	69.3%	67.0%	65.8%	.021	

* Statistical associations are significant at the .001 level unless shown otherwise.

TABLE 3-9(b). MEAN PRACTICE CHARACTERISTICS OF MEDICAL SPECIALISTS, BY AGGREGATE PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-squared	Sig.*
Total number of different patients seen	183	263	301	292	249	.019	
Percent of patients Medicare	45.5%	54.3%	58.5%	55.2%	56.9%	.015	
Aggregate annual number of services	1,373	2,026	2,244	2,139	1,791	.014	
Aggregate total annual billings	$14,943	$25,061	$31,218	$33,733	$38,566	.042	
Adj. mean aggregate unit chg. per svc.	$19.40	$17.30	$16.09	$15.83	$18.63	.010	
Aggregate mean annual svcs. per patient	7.28	7.94	7.59	7.46	6.82	.006	.003
Percent Blue Shield items on UCR	65.6%	66.0%	65.7%	63.2%	57.9%	.035	

* Statistical associations are significant at the .001 level unless shown otherwise.

TABLE 3-9(c). MEAN PRACTICE CHARACTERISTICS OF SURGICAL SPECIALISTS, BY AGGREGATE PRICE INDEX QUINTILES

Practice Characteristic	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared
Total number of different patients seen	206	294	315	296	245	.012
Percent of patients Medicare	53.6%	46.5%	51.6%	44.6%	57.6%	.024
Aggregate annual number of services	788	798	794	702	627	.007
Aggregate total annual billings	$38,992	$49,366	$50,150	$55,537	$49,014	.009
Adj. mean aggregate unit chg. per svc.	$88.73	$94.36	$81.10	$91.30	$67.63	.017
Aggregate mean annual svcs. per patient	3.90	3.01	2.83	2.46	2.58	.034
Percent Blue Shield line items on UCR	70.3%	71.1%	69.5%	66.6%	59.8%	.055

* All listed practice characteristics are statistically significant with AGINDEX at the .001 level.

TABLE 3-9(d). MEAN PRACTICE CHARACTERISTICS OF OTHER SPECIALISTS, BY AGGREGATE PRICE INDEX QUINTILES

Practice Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-squared	Sig.*
Total number of different patients seen	208	464	609	681	374	.045	
Percent of patients Medicare	64.9%	49.6%	44.2%	37.9%	61.5%	.096	
Aggregate annual number of services	1,098	1,841	2,191	2,170	1,188	.049	
Aggregate total annual billings	$12,313	$27,216	$41,172	$49,829	$33,630	.061	
Adj. mean aggregate unit chg. per svc.	$16.16	$18.42	$19.25	$21.52	$19.80	.033	
Aggregate mean annual svcs. per patient	8.68	7.33	5.54	4.43	5.74	.075	
Percent Blue Shield line items on UCR	63.6%	66.6%	69.3%	63.0%	58.6%	.034	.003

*Statistical associations are significant at the .001 level unless shown otherwise.

Specialty-controlled data relating to relative price levels and practice characteristics in each of the two component markets (Blue Shield and Medicare) have been omitted here in the interest of brevity, simplicity, and the reduction of confusion in the overall communication of findings.

In reviewing these four tables and considering the findings in comparison to corresponding elements of Table 3-8(a), the following summary highlights may be noted:

Size of Active Patient Roster. The general strength of relationship observed between relative price levels and practice characteristics for all physicians in the aggregate market continues to hold within broad specialty cohorts of physicians. The eta-squared for medical specialists is about the same as for all physicians, indicating 1.9 percent of the variance in size of active patient roster to be associated with the aggregate price level breakdown. For generalists and for surgical specialists, this drops off a bit, explaining only one percent. For other specialists, there is a substantial strengthening of relationship, to 4.5 percent of variance explained. The positive relationship observed for the overall physician population continues to hold in the generalist and other specialist cohorts, with increased patient roster sizes being generally associated with higher relative price levels. For medical specialists, the relationship is positive from low to mid-range relative price levels, and then levels off and drops slightly for medical specialists in the mid-to-high price range. Among surgical specialists, those with

mid-range prices tend to have the largest active patient rosters. Surgeons at both the high and low ends of the relative price level distribution tend to have fewer patients, with the highest priced surgeons having the least.

Percent of Active Patient Roster Covered By Medicare. The statistical relationship between aggregate price levels and percent of patients covered under Medicare is stronger in every physician specialty cohort than was observed for the composite physician population. For medical specialists, the strength of association is very close to that observed for the overall physician population, with 1.5 percent of variance in proportion covered under Medicare being associated with the aggregate price level breakdown. For generalists and for surgical specialists, this goes up to 2.1 and 2.4 percent, respectively; and for other specialists, it goes up to 9.6 percent. As for all physicians in the aggregate market, the direction of the relationship for generalists and for other specialists is downward sloping, indicating lower relative price levels in association with greater proportions of Medicare patients. The relationship for surgical specialists is irregularly downward sloping, but then breaks sharply upward for surgeons in the highest priced quintile. Among medical specialists, the lowest priced physicians have the smallest proportion of Medicare patients. The proportion of medicare patients increases in moving from the lowest priced medical specialists to those with mid-range prices, but then

essentially levels off from the mid-range to the highest priced medical specialists.

Annual Volume of Services Delivered. The association between aggregate price levels and annual volumes of services delivered is at least as strong in each separate specialty cohort as in the physician population as a whole, and in some cohorts is stronger. This nevertheless remains, overall, a weak factor in relation to aggregate prices, except in the cohort of other specialists. Among other specialists, 4.9 percent of the variance in annual volume of services is associated with the aggregate price level breakdown. For medical specialists, this drops to only 1.4 percent; and for generalists and surgical specialists, the eta-squared is very small and indicates almost negligible relationship between services volume and aggregate relative price level. For medical specialists and other specialists, the greatest service volumes are associated with mid-range price positioning. In both of these cohorts, both higher priced and lower priced physicians tend to perform fewer services. For generalists, the relationship is positive, indicating greater service volumes associated with higher price levels, but with service volumes then dropping off sharply for generalists with the very highest prices. For surgical specialists, the relationship tends generally to be opposite, with higher priced surgeons tending for the most part to be those with the smallest volumes of services delivered.

Annual Dollar Volume of Billings. As noted earlier in relation to the composite physician population, this practice factor tends generally to exhibit a comparatively strong relationship with the price variable for most specialty cohorts. As also noted earlier, however, this can be misleading, since a physician's relative price level certainly is one of the determinants of the magnitude of his total annual billings. When this factor was adjusted to remove relative price influences in the context of the overall physician population, it was found to have negligible relationship to relative price levels in all markets examined. Partitioning the physician population into broad specialty cohorts, however, the size of the practice as measured by the price-adjusted aggregate annual billing volume assumes greater importance in relation to price levels for some specialty cohorts. For surgical specialists, 2.9 percent of the variance in price-adjusted annual billings is associated with the aggregate relative price breakdown; and for other specialists, the level of association is 5.7 percent. The degree of association for medical specialists remains of little consequence, with an eta squared of .010; and for generalists, the eta-squared drops to a negligible .001. (These figures, incidentally, differ from those found in the tables since the annual billings data shown in the tables are not price-adjusted.) The general shape and direction of the relationship for the price-adjusted total billings variable is downward sloping for surgical specialists,

indicating a general tendency for lower dollar volume practices to have higher prices. For other specialists, the relationship is opposite, being positive and indicating a general tendency for higher prices to be associated with higher dollar volume practices. The shape of the relationship for medical specialists is a bit irregular. The absolutely lowest price-adjusted dollar volumes are associated with the lowest prices. The adjusted dollar volume increases extremely sharply in moving from the lowest to the second lowest relative price quintile and then becomes gradually downward sloping.

Price-Adjusted Unit Value of Services Delivered. The mean unit value (intrinsic value) of services delivered in a practice has a relationship to relative price levels in the aggregate market that is stronger for every specialty cohort than it is for the overall physician population. The eta-squared, which was only .006 for the composite physician population, is .014 for generalists, .010 for medical specialists, .017 for surgical specialists, and .033 for other specialists. For other specialists, for instance, this means that 3.3 percent of the variation in intrinsic valuation of services delivered is associated with the breakdown of aggregate relative price levels. For all other cohorts, the relationship, although strengthened, is still relatively marginal. Directional effects associated with the relationship also are quite diverse for different specialty group cohorts. For medical and surgical specialists, the

relationship is negative, associating lower intrinsic values of services with higher prices. For other specialists, on the other hand, the relationship is positive, showing higher prices to be associated with higher intrinsic values of services. For generalists, physicians in the mid-range of the price level distribution have the lowest intrinsic values for their services, with both higher and lower priced generalists having higher intrinsic valuations on their services.

Intensity of Services per Patient. When the overall physician population is partitioned into broad specialty classes, the importance of the services intensity factor in relation to aggregate relative price level diminishes in almost every specialty cohort. This suggests that much of the overall relationship between price and services intensity is in fact attributable to differences between general categories of specialties. Although 3.9 percent of the variance in intensity of services is associated with aggregate price level in the overall physician population, this drops to negligible levels of less than one percent in both the generalist and medical specialist cohorts. In the surgical specialist cohort, the proportion of variance in this factor explained by aggregate price level is roughly the same as in the overall physician population, at 3.4 percent. Within the other specialty cohort, the proportion of variance explained climbs to 7.5 percent. The downward sloping direction of the relationship holds in all specialty cohorts except the medical

specialist cohort, where the detailed character of the relationship is somewhat mixed but appears to have a generally upward sloping tendency.

Proportion of Claim Line Items Reimbursed Under UCR. In analyzing the proportion of Blue Shield claims reimbursed under UCR, the proportion of variance associated with aggregate relative price levels is 2.1 percent for generalists, 3.5 percent for medical specialists, 5.5 percent for surgical specialists, and 3.4 percent for other specialists. In most specialty cohorts, this is down somewhat from the 4.8 percent of variance explanation for this same factor in the composite physician population. Still, when compared to other practice-related factors, the strength of association for this factor with aggregate relative price levels remains fairly substantial. The direction of the relationship is downward sloping, indicating an association of lower relative price levels with relatively higher proportions of UCR, except for other specialists. For other specialists, the highest proportions of UCR are associated with mid-range price levels. Both higher and lower priced physicians in other specialties have lower proportions of UCR reimbursement, with the absolutely lowest proportions of UCR being associated with the highest priced quintile of other specialists.

Summarizing the apparent influences and relationships that may be attributed to various aggregate practice characteristics within broad

specialty groupings, those factors describing size of practice -- i.e., patient roster, services volume, and price-adjusted dollar volume of billings -- are seen to have their strongest relationship to relative prices in the cohort of other specialists. These same factors have some slight, but much less substantial, relationship with price levels in the medical specialist cohort. The price-adjusted volume of annual billings also has a significant relationship with relative price levels in the surgical specialist cohort. The proportion of patients covered under Medicare has at least a modest relationship with aggregate relative prices in all specialty cohorts, but is particularly strongly related in the other specialist cohort. The price-adjusted unit value per service (intrinsic value of services delivered) exhibits a very slight relationship with aggregate price levels in the generalist, medical specialist, and surgical specialist cohorts. The relationship of this factor with price is strongest in the other specialty cohort. Intensity of services has a rather strong relationship to price among other specialists; and a lesser, but still fairly strong, relationship among surgical specialists. The proportion of claims reimbursed under UCR exhibits a fairly substantial relationship with price in all specialty cohorts.

It sometimes also is hypothesized or conjectured that physicians' prices may be related to their productivity or output of services. Defining a physician's output as the product of the annual number of services delivered times the mean intrinsic value of his specific service mix, a relation was sought between physicians' relative prices and output levels. No such relationship could be detected at any significant level.

The findings clearly demonstrate that the relationship of relative price levels to practice characteristics is different for different types of specialties. General and family practitioners appear to be very little affected in their relative price positioning by variations in these general kinds of practice activity characteristics. They exhibit only a relatively moderate tendency to have higher prices in conjunction with smaller proportions of Medicare patients and smaller proportions of claims reimbursed under UCR. Medical specialists show a relatively marginal tendency to have higher price levels in conjunction with larger patient rosters and greater proportions of Medicare patients. Medical specialists' prices also show a somewhat marginal association with practice size as measured by volume of services delivered. The highest service volumes here, however, are associated with medical specialists in the mid-price range. Medical specialists tend also to have lower prices in association with greater proportions of UCR reimbursement. Relative price levels for surgical specialists are related most strongly to proportion of UCR reimbursement, intensity of services delivered, price-adjusted volume of annual billings, and proportion of patients covered under Medicare, in that order. Surgeons' prices also have at least a marginal relationship to intrinsic valuation of services delivered and size of active patient roster. The direction of the relationship of each of these factors with surgeons' prices tends in the main to be downward sloping, except for size of patient roster. On this factor, larger patient rosters are associated with mid-range surgeons' prices. The prices for services of physicians in other specialties show a comparatively strong relationship to all of the practice factors

considered here, with the relationships being most particularly strong for proportion of patients covered by Medicare, intensity of services delivered, and the price-adjusted annual volume of billings. The general tendency among other specialists is for higher prices to be associated with larger practice sizes, greater intrinsic valuations of services, lesser intensity of services delivered, and smaller proportions of both Medicare patients and UCR reimbursement.

The general tendencies and relationships summarized above might be taken as suggesting that general and family practitioners have comparatively little control over their relative price levels -- at least as associated with practice characteristics -- and tend to take what the market will allow. The observations for surgical specialists, on the other hand, might be taken as being consistent with the premise that surgeons are relatively free to exercise considerable personal discretion in establishing prices that are favorably related to their practice characteristics. The observed relationships simply are not as neatly ordered for medical specialists, and cannot be as readily interpreted. Among other specialists, the prominently strong associations observed here may be, more than anything else, a reflection that this cohort contains a highly diverse lot of specific specialties, each having rather characteristic practice patterns and representative price levels relative to the others.

V. FINDINGS: ANALYSIS OF VARIANCE ON LOCALITY FACTORS

A. PHYSICIAN PRICE VARIATION BETWEEN GEOGRAPHIC AREAS

Substantial variation in physicians' prices between markets in different geographic areas has been observed in previous studies (e.g., Wennberg and Gittleson, 1973; Burney et al., 1978), as well as in earlier stages of this study of the Pennsylvania physicians' services market (Markel and Dudley, 1981). The variation in average relative price levels for individual physicians in various medical market areas in Pennsylvania is demonstrated in Table 3-10. The market area breakdown in this table differentiates between: (1) major metropolitan areas, with more specific differentiation between Philadelphia and Pittsburgh; (2) lesser metropolitan areas, including detailed differentiation between ten specific lesser metropolitan areas; and (3) rural and other areas. It should be noted that the metropolitan areas identified in Table 3-10 are not the whole-county or multiple whole-county Standard Metropolitan Statistical Areas (SMSAs) customarily used in most studies. Rather, they are defined in accordance with Bureau of the Census definitions of the urbanized areas associated with each of the specific named places. As such, they can be presumed to represent much more sharply defined local medical services market areas than are ordinarily provided by reference to entire SMSAs.

The findings presented in Table 3-10 show that, as expected, the lowest prices for physicians' services tend for the most part to be found in rural areas, and the highest are found in the state's largest major

TABLE 3-10. MEAN PHYSICIAN PRICE INDEXES, BY URBANIZED AREAS WITHIN LINES OF BUSINESS

Area	BSINDEX	MBINDEX	AGINDEX
Statewide Average	96.2	100.5	98.6
Major Metropolitan Areas:	102.6	109.2	106.3
Philadelphia	108.0	113.2	110.5
Pittsburgh	90.3	99.4	96.3
Lesser Metropolitan Areas:	92.5	96.1	94.2
Altoona	79.9	87.7	85.0
Johnstown	103.1	106.2	104.4
York	92.9	95.1	92.6
Lancaster	81.7	85.1	84.1
Allentown-Bethlehem-Easton	92.6	96.2	93.6
Wilkes-Barre	92.0	97.8	95.8
Scranton	98.0	105.6	102.7
Erie	94.2	96.0	95.1
Reading	87.0	92.9	90.6
Harrisburg	93.6	95.3	94.2
Rural and Other	87.1	87.7	87.6

metropolitan area. Prices for physicians' services in Philadelphia, in comparison to rural areas, are 24.0 percent higher in the Blue Shield market, 29.1 percent higher in the Medicare market, and 26.1 percent higher in the aggregate market. Prices of physicians' services in the Pittsburgh urbanized area, on the other hand, are surprisingly low. Compared to the prices of these services in rural areas, Pittsburgh physicians' prices are a relatively modest 3.7 percent higher in the Blue Shield market, 13.3 percent higher in the Medicare market, and 9.9 percent higher in the aggregate. In a direct comparison of the two major metropolitan areas, physicians' prices in Philadelphia are found on the whole to be 19.6 percent higher than in Pittsburgh for the Blue Shield market, 13.9 percent higher for the Medicare market, and 14.7 percent higher for the aggregate market. Lesser metropolitan areas have physicians' prices relative to rural areas that, on the average, are 6.2 percent higher in the Blue Shield market, 9.6 percent higher in the Medicare market, and 7.5 percent higher in aggregate. The table shows further that there are substantial relative price level variations between different lesser metropolitan areas, with some of them having lower prices on the average than are found in rural areas. It also may be observed that the relatively low average price levels in Pittsburgh actually are lower than those found in several of the lesser metropolitan areas. Johnstown, for instance, has the second highest prices in the state; and the next highest prices after that are in the Scranton urbanized area, with Scranton area prices being high most particularly in the Medicare market. It is interesting to note that, except for the direct comparison between Philadelphia and Pittsburgh, inter-area price differences rather

universally tend to be more pronounced in the Medicare market.

The breakdown by metropolitan areas given in Table 3-10, including "rural and other" as a composite residual market, accounts for 12.8 percent of physician price variation in the Blue Shield market, 13.5 percent in the Medicare market, and 12.9 percent in the aggregate market. In a complete county breakdown of the entire state, the proportion of variance in physicians' prices accounted for at the county level is 16.4 percent under Blue Shield, 14.2 percent under Medicare, and 14.5 percent in the aggregate.

B. PRACTICE LOCALE CHARACTERISTICS IN RELATION TO PRICES

In trying to sort out why these price differences occur as they do from area to area, one would like to believe they can be at least partially explained by essential differences in basic characteristics of the localities themselves -- for example, local differences in costs of practice inputs, differences in local supplies of physician and hospital resources, or differences in social and economic factors, such as population income or the proportion of aged persons in the population, which theoretically are associated with demand creation. Table 3-11 identifies a number of potentially important locality factors and displays their general distribution with respect to aggregate physician price level quintiles. Eta-squared statistics again are included as a measure of the strength of statistical association between the aggregate price variable and each of the listed locality factors. The progression from the first quintile (Q1) to the fifth quintile (Q5) again moves from the lowest

TABLE 3-11. MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	2,189	2,781	3,626	4,298	6,950	.090	
Percent minorities	6.8%	8.4%	10.4%	12.0%	17.9%	.087	
Percent aged 65 or older	12.2%	12.2%	12.3%	12.3%	12.6%	.009	
Per capita income	$3,016	$3,148	$3,211	$3,249	$3,238	.029	
Percent of families below poverty level	8.0%	7.6%	7.5%	7.6%	8.3%	.013	
Median school years completed	11.6	11.71	11.70	11.70	11.52	.015	
Percent college graduates in population	8.4%	9.0%	9.3%	9.5%	9.2%	.011	
Percent laborers in workforce	5.1%	4.9%	4.7%	4.6%	4.5%	.041	
Percent of workforce unemployed	5.6%	5.5%	5.6%	5.6%	5.9%	.011	
Percent of voted conservative	50.1%	49.0%	47.8%	46.9%	43.1%	.059	
Consumer price index (CPI)	114.2	115.5	116.5	117.1	118.4	.103	

*Significant at .001 level unless shown otherwise.

TABLE 3-11. MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES (Cont'd)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	452.2	462.2	475.5	487.8	520.0	.016	
Direct patient care phys. per 100,000	102.4	111.5	116.1	121.3	120.6	.031	
Primary care physicians per 100,000	46.4	48.9	50.9	52.2	54.9	.057	
Medical specialists per 100,000	21.7	25.4	28.4	30.6	34.6	.099	
Surgical specialists per 100,000	22.8	26.1	27.6	29.2	28.9	.022	
Mean monthly pay per phys. off. employee	$1,273	$1,313	$1,316	$1,323	$1,312	.006	
Median monthly contract rent	$ 105	$ 112	$ 116	$ 119	$ 120	.034	
Health Insurance and Subsidization:							
Blue Shield penetration	48.6%	52.3%	55.1%	56.2%	60.1%	.030	
Annual Blue Shield payments per capita	$15.72	$17.76	$18.48	$19.10	$19.25	.028	
Annual Medicare B allowances per capita	$18.77	$21.16	$23.06	$24.88	$28.99	.105	
State health expenditures per capita	$61.37	$61.45	$65.52	$69.59	$83.25	.046	

*Significant at .001 level unless shown otherwise.

priced 20 percent of physicians to the highest. Data are not given separately for the component Blue Shield and Medicare B markets, since the observed relationships of locality characteristics to physicians' prices are reasonably similar in both market segments.

Among the general demographic and socioeconomic factors, three that emerge as quite strongly related to physicians' relative price levels are the locally projected CPI, the population density, and the proportion of minorities in the population. These have eta-squared of .103, .090, and .087, respectively; and all are related positively to the price variable. The next strongest factors after that are the general political orientation of the population, with an eta-squared of .059, associating higher prices with places having more liberal political orientation; the percentage of laborers in the composition of the workforce, inversely related to physicians' price levels, with eta-squared .041; and per capita income, related positively, with eta-squared .029. The remaining demographic and socioeconomic factors among those considered here show only slight relationship to the prices of physicians' services in an area.

For some further perspective on these observations, it may be noticed that the factors most strongly related to high physician prices -- viz., high CPI, greater population density, greater proportions of minorities, and liberal politics -- are an amalgam characteristically associated with the urban condition. It may be pointed out that, not surprisingly, the four factors here identified with urbanism also are found to be greatly multicollinear. The proportion of minorities in the population in fact has a correlation of .99 with population density, and thus is so greatly confounded with population density that it has no practical value as an

independent free-standing factor. It would be reasonable to think of these four factors as collectively representing a composite factor called "urbanization," and then to simply use population density as a proxy for urbanization. The composite factor, urbanization, then is seen as being strongly and positively related to the prices of physicians' services in an area. Unfortunately, this still provides little help toward understanding exactly what it is about urban places that causes physicians' prices to be higher there. It may, nevertheless, be safe to presume that many of the component elements in the overall condition of urbanism act as generators of higher levels of demand for physicians' services. Also, while proposing the composite factor "urbanization" with population density as its proxy, it may be conceptually wise to retain the locally projected CPI as a separate and more purely economic variable representing the underlying inflationary pressure upon prices in an area.

The observed relationship of per capita income with physicians' prices might be interpreted as a manifestation of greater purchasing power being translated into higher levels of demand, which then possibly could be reflected in higher prices. This is consistent with the companion observation that smaller proportions of laborers in the workforce coincide with higher prices, considering that laborers are low paid workers. It is intriguing, though, to note that the eta-squared is somewhat larger for proportion of laborers than for per capita income. This may suggest that the proportion of laborers in the workforce has an influence upon local medical services economies that transcends the simple income-related aspects of occupational status. In particular, it might be conjectured that there are certain attitudes, value systems, or cultural biases

associated with the "working man" in lower occupational status groups that translate into avoidance or delay behaviors in regard to the seeking of medical care. If so, the demand for physicians' services could be lower at places where there are proportionately greater numbers of laborers in the workforce, and this in turn could be reflected in lower prices.

There is apparently no particular importance assignable to factors having to do with education, the proportion of elderly persons in the population, unemployment, or the relative presence of poverty families in the population.

Among the medical service supply factors, it can be seen that some of the physician supply factors are relatively important. While the overall supply of direct patient care physicians has only a comparatively modest level of association with physician price levels, the supply of medical specialists is most particularly important. The eta-squared of .099 indicates that nearly 10 percent of the variance in the supply of medical specialists relative to population is associated with relative price levels. The supply of primary care physicians also is moderately important; but the supply of surgical specialists apparently is of relatively small consequence. The supply of physicians in all cases is seen to be positively correlated with physician price levels -- i.e., prices for physician services are higher where there are more doctors. Higher physicians' prices also are associated with greater supplies of general hospital beds in an area, but this relationship is quite weak.

Cost factors associated with the operation of a physician's practice are on the whole not very important. Of the two cost factors considered here, the cost of space/facilities rental is modestly and positively

related to relative price levels. Costs associated with the physician's office staff are of no demonstrable importance in relation to physician prices.

The presence of health insurance and greater levels of subsidization of health care services from public funds are associated with higher relative price levels in an area. The proportional presence of Blue Shield subscribers in the population and the entry of Blue Shield money into the local physicians' services market are only modestly important, however. The most prominent factor here is the entry of Medicare Part B money into the local physicians' services economy. Not only is 10.5 percent of the variance in per capita Medicare B Allowances associated with relative price levels, but the Pearson correlation of this factor with the aggregate relative price index is .32, a correlation greater than any other locality-related factor. The presence of state money in the local medical services economy also has at least a little importance, with an eta-squared of .046.

In summary, the most important specific factors among locality characteristics are, in this order: (1) Medicare Part B allowed charges per capita; (2) area CPI; (3) supply of medical specialists relative to population; (4) population density; (5) primary care physician supply, relative to population. The proportion of minority persons in the population, which also appears to be quite significant, is dismissed as being too strongly correlated with population density to be independently meaningful. Liberal-conservative political orientation similarly had a fairly large eta-squared, but is highly correlated with population density. In larger generalities, it would appear that no great importance

can be assigned to conventional demand-creating or demand-related variables. Population income is of only modest importance, with positive relationship. Also of only moderate importance is the proportion of laborers in the workforce, which is negatively related, and (as noted above) might reflect a cultural bias as much as an income-related phenomenon. The proportion of elderly persons in the population, generally regarded as needing more health care services and therefore as demand-generating, is of little effect. Generally upgrade social indicators, such as educational achievement, are of no practical importance at all. Urbanization, as a composite influence encompassing a number of specific factors, appears to be quite strongly related to higher price levels for physicians' services. Another prominent influence tending to increase physicians' prices is the entry of money from health insurance and publicly-funded medical care programs -- especially Medicare -- into the local medical services economy. The input of such financial resources into the local economy releases personal monetary constraints that normally might act to inhibit consumer demand. Physician supply is found to be significantly and positively related to physicians' relative prices, further confirming similar findings from a number of previous studies (see Section II.A.3). This effect is found most particularly for the supply of medical specialists and, to a somewhat lesser extent, the supply of primary care physicians. Hospital bed supply is of little or no consequence. Finally, of the two practice cost factors considered here, the salaries of office staff are of no practical importance, and rental costs for space and facilities are of only modest importance, in relation to physicians' prices.

C. PRACTICE LOCATION FACTORS WITHIN SPECIALTY COHORTS

Tables 3-12(a) through (d) display distributions of locality characteristics over physician price quintiles in the aggregate market, along with associated eta-squared statistics, paralleling the data previously shown in Table 3-11 but controlled for broad specialty groups. Table 3-12(a) displays observed distributions and eta-squares for the cohort of general and family practice physicians; Table 3-12(b) displays corresponding data for medical specialists; Table 3-12(c) for surgical specialists; and Table 3-12(d) for other specialists.

Comparing the observed relationships for the subset of general demographic and socioeconomic variables cross-sectionally between different broad specialty cohorts, it is seen that urbanization persists as an important composite factor throughout all specialty cohorts. Population density, as a proxy for urbanization, has eta-squared measures with the aggregate price breakdown ranging from .053 to .103. Other specific factors that might serve as components or indicators of urbanization also tend generally to show some relative importance in all specialty cohorts. The locally projected CPI appears as a more-or-less important factor in all cohorts, with eta-squared ranging from .052 to .100. On the other hand, the relationship of per capita income to the price variable tends to vary significantly from one specialty group to another. The population income variable relates to price only modestly in the cohort of surgical specialists, with a strength of association very close to that observed earlier for the overall physician population. The

TABLE 3-12(a). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL) BY AGGREGATE PRICE INDEX QUINTILES, FOR GENERAL AND FAMILY PRACTICE PHYSICIANS ONLY

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	1,730	2,344	4,053	4,289	5,582	.060	
Percent minorities	5.5%	7.2%	11.2%	11.7%	14.6%	.061	
Percent aged 65 or older	12.1%	12.1%	12.2%	12.2%	12.3%	.002	.267
Per capita income	$2,983	$3,158	$3,214	$3,279	$3,265	.046	
Percent of families below poverty level	8.0%	7.4%	7.5%	7.4%	7.8%	.008	
Median school years completed	11.63	11.72	11.66	11.72	11.63	.005	.003
Percent college graudates in population	8.2%	9.0%	9.2%	9.8%	9.6%	.022	
Percent laborers in workforce	5.2%	4.8%	4.6%	4.5%	4.5%	.044	
Percent of workforce unemployed	5.6%	5.4%	5.6%	5.6%	5.8%	.005	.004
Percent voted conservative	51.0%	50.1%	47.3%	46.9%	45.2%	.040	
Consumer price index (CPI)	113.5	115.1	116.5	117.0	117.8	.098	

* Significant at .001 level unless shown otherwise.

TABLE 3-12(a). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL) BY AGGREGATE PRICE INDEX QUINTILES, FOR GENERAL AND FAMILY PRACTICE PHYSICIANS ONLY (Cont'd)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	427.1	425.8	461.0	475.9	495.3	.014	
Direct patient care phys. per 100,000	98.8	109.8	114.9	121.8	122.0	.043	
Primary care physicians per 100,000	46.0	49.2	51.7	53.3	54.6	.052	
Medical specialists per 100,000	19.9	24.1	28.5	30.7	32.7	.089	
Surgical specialists per 100,000	21.1	25.0	26.8	29.8	29.6	.036	
Mean monthly pay per phys. off. employee	$1,238	$1,286	$1,298	$1,301	$1,291	.014	
Median monthly contract rent	$103	$113	$118	$123	$124	.054	
Health Insurance and Subsidization:							
Blue Shield penetration	45.5%	49.1%	52.8%	52.1%	53.8%	.019	
Annual Blue Shield payments per capita	$14.58	$16.95	$17.88	$18.48	$18.63	.033	
Annual Medicare B allowances per capita	$17.52	$20.18	$23.57	$25.14	$27.02	.081	
State health expenditures per capita	$60.15	$59.19	$66.87	$69.84	$77.49	.018	.004

*Significant at .001 level unless shown otherwise.

TABLE 3-12(b). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR MEDICAL SPECIALISTS ONLY

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	3,434	3,959	4,081	4,630	7,658	.073	
Percent minorities	10.2%	11.5%	11.7%	12.8%	19.5%	.067	
Percent aged 65 or older	12.5%	12.6%	12.3%	12.4%	12.7%	.006	.003
Per capita income	$3,139	$3,164	$3,249	$3,269	$3,249	.010	
Percent of families below poverty level	7.8%	7.9%	7.5%	7.7%	8.5%	.017	
Median school years completed	11.70	11.66	11.70	11.69	11.47	.027	
Percent college graduates in population	8.9%	9.0%	9.6%	9.6%	9.2%	.005	.007
Percent laborers in workforce	4.9%	4.8%	4.7%	4.5%	4.4%	.033	
Percent of workforce unemployed	5.7%	5.7%	5.5%	5.6%	5.9%	.015	
Percent voted conservative	47.7%	47.1%	47.2%	46.9%	42.3%	.047	
Consumer price index (CPI)	116.2	116.6	117.0	117.4	118.8	.052	

* Significant at .001 level unless shown otherwise.

TABLE 3-12(b). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR MEDICAL SPECIALISTS ONLY (Cont'd)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	500.1	518.9	483.9	496.0	529.7	.010	
Direct patient care phys. per 100,000	112.0	116.4	119.4	122.9	121.8	.010	
Primary care physicians per 100,000	48.4	50.1	51.9	53.1	56.0	.049	
Medical specialists per 100,000	26.7	29.0	30.2	32.0	36.1	.062	
Surgical specialists per 100,000	26.7	28.2	29.0	30.2	29.3	.005	.012
Mean monthly pay per phys. off. employee	$1,343	$1,337	$1,324	$1,325	$1,300	.005	.007
Median monthly contract rent	$111	$113	$118	$120	$121	.018	
Health Insurance and Subsidization:							
Blue Shield penetration	55.6%	58.0%	57.7%	57.2%	61.7%	.010	
Annual Blue Shield payments per capita	$18.16	$19.11	$19.29	$19.19	$19.28	.003	.099
Annual Medicare B allowances per capita	$21.95	$23.90	$24.09	$25.61	$30.18	.077	
State health expenditures per capita	$65.30	$69.78	$68.17	$70.94	$85.79	.042	

*Significant at .001 level unless shown otherwise.

TABLE 3-12(c). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR SURGICAL SPECIALISTS ONLY

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	2,169	2,618	2,927	3,931	6,842	.103	
Percent minorities	6.9%	8.2%	8.9%	11.3%	17.7%	.098	
Percent aged 65 or older	12.3%	12.2%	12.4%	12.4%	12.7%	.013	
Per capita income	$2,986	$3,105	$3,163	$3,207	$3,210	.025	
Percent of families below poverty level	8.3%	7.7%	7.6%	7.7%	8.4%	.015	
Median school years completed	11.68	11.75	11.73	11.71	11.53	.023	
Percent college graduates in population	8.4%	9.0%	9.2%	9.3%	9.0%	.006	
Percent laborers in workforce	5.2%	5.1%	4.8%	4.7%	4.5%	.050	
Percent of workforce unemployed	5.8%	5.6%	5.7%	5.7%	5.9%	.010	
Percent voted conservative	50.0%	48.6%	48.5%	46.9%	43.1%	.068	
Consumer price index (CPI)	114.2	115.4	116.1	116.9	118.4	.100	

*Significant at .001 level unless shown otherwise.

TABLE 3-12(c). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR SURGICAL SPECIALISTS ONLY (Cont'd)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	471.0	480.8	489.6	493.7	520.2	.010	
Direct patient care phys. per 100,00	102.0	108.9	113.6	117.3	117.5	.022	
Primary care physicians per 100,000	45.3	46.8	49.0	50.8	53.8	.063	
Medical specialists per 100,000	21.7	24.6	26.8	29.3	33.5	.092	
Surgical specialists per 100,000	23.5	25.8	26.9	28.3	27.7	.012	
Mean monthly pay per phys. off. employee	$1,289	$1,343	$1,332	$1,334	$1,324	.005	.005
Median monthly contract rent	$104	$110	$112	$116	$118	.027	
Health Insurance and Subsidization:							
Blue Shield penetration:	49.8%	53.2%	55.0%	57.6%	60.3%	.025	
Annual Blue Shield payments per capita	$16.31	$17.92	$18.21	$19.33	$19.15	.019	
Annual Medicare B allowances per capita	$18.88	$20.43	$21.71	$24.05	$28.41	.115	
State health expenditures per capita	$60.89	$60.89	$62.04	$68.33	$82.69	.066	

*Significant at .001 level unless shown otherwise.

TABLE 3-12(d). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR OTHER SPECIALISTS ONLY

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demo-raphic/Socioeconomic:							
Population density	3,013	2,363	3,070	4,689	5,820	.052	
Percent minorities	8.8%	7.6%	8.9%	12.5%	15.2%	.048	
Percent aged 65 or older	12.4%	12.5%	12.3%	12.0%	12.6%	.017	.058
Per capita income	$3,068	$3,222	$3,296	$3,282	$3,318	.022	.017
Percent of families below poverty level	8.0%	7.4%	6.9%	7.2%	7.9%	.020	.036
Median school years completed	11.70	11.74	11.73	11.67	11.59	.010	.250
Percent college graduates in population	8.8%	9.2%	9.7%	9.6%	9.6%	.006	.516
Percent laborers in workforce	4.9%	4.7%	4.6%	4.6%	4.5%	.020	.029
Percent of workforce unemployed	5.7%	5.5%	5.4%	5.4%	5.7%	.015	.088
Percent voted conservative	49.1%	49.1%	48.5%	46.4%	45.2%	.027	.005
Consumer price index (CPI)	115.1	116.1	116.7	117.4	118.0	.057	

*Significant at .001 level unless shown otherwise.

TABLE 3-12(d). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR OTHER SPECIALISTS ONLY (Cont'd)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	480.9	459.4	448.4	456.4	502.6	.010	.243
Direct patient care phys. per 100,000	107.6	120.2	123.5	118.2	131.1	.028	.005
Primary care physicians per 100,000	47.5	51.7	52.1	52.8	56.6	.047	
Medical specialists per 100,000	24.5	27.1	29.5	30.2	35.3	.063	
Surgical specialists per 100,000	25.4	28.9	30.7	27.6	33.5	.024	.012
Mean monthly pay per phys. off. employee	$1,313	$1,310	$1,297	$1,326	$1,336	.005	.623
Median monthly contract rent	$109	$114	$120	$122	$123	.024	.012
Health Insurance and Subsidization:							
Blue Shield penetration	52.4%	53.5%	58.4%	57.1%	59.0%	.013	.138
Annual Blue Shield payments per capita	$17.22	$18.94	$20.22	$19.44	$20.56	.017	.051
Annual Medicare B allowances per capita	$21.05	$22.02	$23.28	$24.94	$29.10	.064	
State health expenditures per capita	$62.88	$56.93	$65.78	$69.03	$81.36	.049	

*Significant at .001 level unless shown otherwise.

strength of association of this factor for generalists rises, however, to a level almost double that observed for surgeons; and for medical specialists, it drops to an almost negligible level. The proportion of laborers in the workforce appears at a moderate, but persistently steady, level of relationship throughout all cohorts. Other general demographic and socioeconomic factors noted earlier as being of little consequence relative to prices in the overall physician population also tend to be relatively inconsequential factors within the various broad specialty cohorts.

Although the proportion of laborers in the workforce, as noted above, appears persistently in all specialty cohorts at a more-or-less moderate level of relationship, this factor does vary slightly between cohorts, with the eta-squared being a bit lower for surgeons and a bit higher for generalists and medical specialists. This slight degree of variation may tend to support the cultural influence hypothesis suggested earlier in connection with this factor. The observed differences may be consistent with behaviors that look upon surgical services in general as being less arbitrarily elective and avoidable, while avoidance and delay behaviors would be even more strongly evidenced in relation to the comparatively "soft" services of the generalist or medical specialist. Thus, with avoidance and delay behaviors being less manifested in surgical services, the demand for these kinds of services would be less damped by higher proportions of laborers in the workforce, and related price effects would be diminished.

As observed earlier for the overall physician population, the supply of medical specialists and primary care physicians appears as a

substantially important factor in relation to price within all specialty cohorts. The supply of medical specialists appears to be a most especially important factor. Supplies of surgeons and overall physician supply are not very important in any cohort, except for the effect of overall direct patient care physician supplies in the cohort of general and family practice physicians. Hospital bed supplies, which failed to show any importance as a factor in relation to prices in the overall physician population, shows even less importance in individual specialty cohorts.

When the physician population is partitioned into broad specialty cohorts, space rental costs become relatively significant for general and family practitioners. On the other hand, the cost of space in which to practice drops to no significance among medical specialists, and shows only the most marginal relationship to price for surgical and other specialists. The office salary factor is of negligible importance to specialists of all kinds, and almost negligible among generalists.

The input of Medicare money to local physicians' services markets is a very important factor, related to higher prices in all specialty cohorts. This effect is most prominent in the cohort of surgical specialists, where 11.5 percent of the variance in per capita Medicare Part B allowed charges is associated with the aggregate price level breakdown. Input of money to the local physicians' services market from health care programs at the state level also ranks fairly high as an important factor in relation to price levels, with eta-squared ranging from .042 to .066, except in the generalist cohort. Blue Shield insurance, whether measured in terms of local health insurance market

penetration or in terms of the volume of Blue Shield payments into the local physicians' services economy, appears to be of little or no consequence in relation to physicians' price levels, except among generalists. Even among generalists, the eta-squared for per capita Blue Shield payments is a rather modest .033.

In general, it can be said that the factors which were revealed as being more or less important in the overall physician population also tend to turn up as being important to some degree in all specialty cohorts. The only factors which vary substantially from one specialty group to another are per capita Blue Shield payments, per capita state expenditures for medical care, rent costs, and per capita income. For these four variables, the observed differences in strength of relation to the price variable are mainly between generalists on the one hand, and specialists of any kind on the other. Blue Shield money input to the local physicians' services market is more important to generalists; state money is more important to specialists. Rents and per capita income are relatively important factors for generalists, but are of little importance to specialists. The directional aspects of each locality factor in relationship with the price variable are consistent throughout all specialty cohorts.

Summarizing by specialty groups, the most important locality factors in relation to prices of general and family practice physicians (and associated eta-squares) are, in this order: CPI (.098); supply of medical specialists (.089); per capita Medicare Part B allowances (.081); urbanization, proxied by population density (.060); rent costs (.054); supply of primary care physicians (.052); per capita income (.046);

proportion of laborers in the workforce (.044); supply of all direct patient care physicians (.043); supply of surgical specialists (.036); and per capita Blue Shield payments (.033). Clearly, generalist physicians' prices are affected by, or at least are somehow related to, many different influences. The relative prices of generalists tend to exhibit quite strong relationships to some conventional economic forces. For example, the findings show that this group's prices are most affected by underlying monetary inflation pressures, and that they also bear a fairly strong positive relationship to per capita income, which may entail a demand-related effect upon prices. The local price structures for generalists apparently respond strongly to the presence of other doctors in the local market, being especially responsive to the supplies of medical specialists. The observed positive relationship between physician supplies and the prices of physicians' services is contrary to most conventional and accepted market theories, but is consistent with the findings of several previous studies. The generalist's prices are positively related to the input of health insurance monies into the local physicians' services market, and in general the relationship is quite strong. The generalist also is subject to the previously discussed influences of urbanization, but to a lesser extent than either medical specialists or surgical specialists. Finally, more than any other specialty-related cohort, generalists appear to be subject to the effects of variations in practice costs, especially the costs of space in which to practice, as represented by mean contract rents in localities.

It has been noted, incidentally, that the generalist's price response to the set of insurance and subsidization factors is strongest for

Medicare inputs to the local economy, considerably weaker for Blue Shield inputs, and weakest of all for inputs from state-related programs. The insertion of such monies into a local economy most certainly increases the demand for physicians' services by removing or mitigating the demand constraints of limited purchasing power for many consumers. For generalists, the observed differences in strength of relationship for inputs of monies from different sources probably reflect the fact that Medicare payments can cover the services of generalists, and thus can affect them directly, whereas Blue Shield reimbursements for generalists are more greatly limited. Further, the input of state monies quite possibly has little impact on generalists because a great many of them choose not to participate in state-related programs.

For medical specialists, the locality factors most strongly related to their prices (and associated eta-squares) are: per capita Medicare Part B allowances (.077); urbanization, proxied by population density (.073); supply of medical specialists (.062); CPI (.052); supply of primary care physicians (.049); per capita state expenditures for medical care (.042); and proportion of laborers in the workforce (.033). The general overall relationship of medical specialists' prices to locality characteristics is less strong than for either generalists or surgical specialists. The price levels for physicians in this specialty cohort are rather strongly affected by the availability in the local medical economy of publicly funded program monies for medical care, especially Medicare Part B inputs. Price levels in this group increase with increasing urbanization; but the price response of the medical specialist cohort to underlying general inflationary pressures, as measured by the locally

projected CPI, is only approximately half that observed for generalists and surgical specialists. It is most interesting to note that -- except for the possibility of some very uncertain, amorphous, and indirect influences that might be reflected through relative CPI levels, through inputs of Medicare money, or through degree of urbanization -- medical specialists' prices do not seem to have any relationship to any of the conventional explicit demand factors.

Locality factors most strongly related to surgical specialists' prices (and associated eta-squares) are: per capita Medicare Part B allowances (.115); urbanization, proxied by population density (.103); CPI (.100); supply of medical specialists (.092); per capita state expenditures for medical care (.063); supply of primary care physicians (.063); and proportion of laborers in the workforce (.050). This specialty group is the most strongly affected of all by locality factors in relation to the prices of their services, but the relationships are limited to comparatively few factors. The availability and input of publicly funded program money, again most particularly from Medicare, exert a huge influence on the prices of surgeons' services. The positive price impact of urbanization also is stronger than in any other specialty cohort. The relationship of surgeons' prices to the locally projected CPI is strong; but other kinds of economic factors potentially related to demand are missing. As in other cohorts, there is a positive relationship of price to supply of medical specialists and primary care physicians.

The relationships of locality factors to prices of services for other specialists are somewhat less clearly defined and more tenuous than for other cohorts. Many of the locality variables are not statistically

significant in relation to the price variable for other specialists; and the indicated relationships in general are not as strong as for other groups of physicians. Those factors showing some substantial relationship to other specialists' prices (including eta-squares) are: per capita Medicare Part B allowances (.064); supply of medical specialists (.063); CPI (.057); urbanization, proxied by population density (.053); per capita state expenditures for medical care (.049); and supply of primary care physicians (.047). Because of the diverse internal composition of this cohort, it might be somewhat risky to attempt further and more detailed interpretation of these findings.

D. RELATION OF PHYSICIAN SUPPLIES TO RELATIVE PRICE LEVELS

The findings presented in Tables 3-11 and 3-12(a) through (d) indicated, among other things, that prices of individual physicians' services are related positively to physician supplies at the county level in Pennsylvania. This is true of supplies in all physician cohorts relative to prices in all physician cohorts. The background discussion and review of the literature in Section II.A noted that a positive relation between physician supplies and physician prices has been found in other studies, that it is contrary to theoretically predicted behavior under most conventional market models, and that this seemingly perverse response of physician prices to physician supplies is a source of much concern, speculation, and research interest. In view of the level of interest continuing to attend such findings, some special attention should be devoted to these phenomena and to the general issue of provider supply

vis-a-vis price in the physicians' services market.

Table 3-13 displays Pearson correlation coefficients for local population-based physician supply variables in various specialty-oriented physician cohorts with aggregate relative price levels for the services of physicians in all of the same cohorts. The data as presented permit not only an appraisal of the relationship between supplies and prices within any given cohort, but also an appraisal of supply-price relationships between different cohorts. In more recent research, this distinction between within-specialty effects and cross-specialty effects, generally is perceived as a valuabe and useful refinement. The supply of physicians in any specialty-oriented cohort may be related to the prices of physicians in the same cohort in a manner that reflects the effects of varying degrees and kinds of competition in a finite market for services of physicians who deliver similar and relatively homogeneous services; but when relating the supply of physicians in one specialty cohort to the prices of physicians in a different cohort, the result may be a reflection of other kinds of interaction processes. Often, for example, this may take the form of a non-competing, perhaps complementary, and even demand-generating relationship from one specialty group to another.

The correlations in Table 3-13 show, starting at a rather general level of examination, that general and family practitioners are the group most affected by overall physician supply, and medical specialists are the least affected. On the obverse side of this, general price levels in the overall physician population are highly correlated most generally with the supply of medical specialists, and least correlated with the supply of generalists. The symmetry in this probably is not coincidental, and

TABLE 3-13. CORRELATION OF PHYSICIANS' AGGREGATE RELATIVE PRICE LEVELS WITH PHYSICIAN SUPPLY FOR SELECTED SPECIALTY GROUP COHORTS

	Pearson Correlation with Aggregate Price Indexes for:					
Supply of:	All DPC Phys.	GP/FP	Primary Care	Medical Spec.	Surgical Spec.	Other Spec.
All Direct Patient Care (DPC) Physicians	.14	.18	.16	.08	.12	.08
General & Family Practice Physicians	.05	.03	.04	.13	.09	.06
Primary Care Physicians	.23	.21	.22	.22	.24	.15
Medical Specialists	.31	.28	.29	.26	.31	.20
Surgical Specialists	.12	.16	.14	.05	.08	.07
Other Specialists	.13	.17	.14	.06	.09	.08

immediately points up the power and influence of medical specialists in the profession as a whole, while also illustrating the comparative market vulnerability of generalist physicians and the relative powerlessness of generalists to exert any substantial influence of their own on the economics of the market as a whole.

The correlations found on the main diagonal of the matrix represent within-specialty interactions of physician supplies and prices. It can be seen that the within-specialty correlation of prices and supplies in the cohorts of primary care physicians and medical specialists are rather strong. On the other hand, generalist physician prices show very little relationship to supplies of physicians of their own type. Surgeons also show a comparative low level of within-specialty correlation between supplies and prices.

Throughout the matrix as a whole, cross-specialty effects are very much in evidence. Those whose prices are most strongly correlated with supplies in specialty groups other than their own, as well as with overall physician supplies, are the general and family practice physicians. Further paralleling the findings noted above in relation to the overall physician population, it is the medical specialist cohort whose prices are least correlated with supplies in specific other cohorts. Reversing the supply and price roles, medical specialist supplies also are seen to have the highest overall correlations with prices of physicians in specific other cohorts. If one is willing to venture a bold inferential leap and at least tentatively assign cause and effect so that the correlations are viewed as indicators of the effect of supply upon price, this again would suggest that generalist physicians are the most affected by, and

themselves exert the least influence upon, physicians in other cohorts. By the same token, medical specialists would appear to be the least affected by, and themselves exerting the greatest influence upon, other kinds of physicians. Interestingly, medical specialist supplies appear to have a stronger relationship to prices in nearly every other cohort than to prices in their own cohort. Medical specialist supplies are especially strongly correlated with surgeons' prices. The supplies of primary care physicians as a group also show stronger correlation with surgeons' prices than with their own prices or with the prices of any other cohort. This may be a reflection that medical specialists and primary care physicians play a role as generators of demand for surgeons' services. The specific conjecture here would be that primary care physicians and medical specialists, when present themselves in greater numbers, generate more overall patient activity and, hence, also generate correspondingly more referrals to surgeons. The supplies of surgeons themselves, as well as supplies of "other" specialists, have comparatively little relationship to prices either in or out of their own cohorts. While there is some modest correlation of supplies of surgeons and "others" with the prices of generalists and primary care physicians, it is not clear what this might mean.

At a slightly higher level of generalization, the overall supply of direct patient care physicians shows greater correlation with the prices of generalists and primary care physicians than with the prices of specialists as a whole. The same is true for the supply of surgeons. Generalists, however, show the opposite. The supply of general and family practice physicians is more strongly correlated with the prices of

specialists than with the prices of generalist or primary care physicians. This may be a reflection of the complementary roles of generalists and surgeons. Supplies of primary care physicians and medical specialists show fairly high levels of correlation with the prices of physicians in every cohort, as well as with prices in the overall direct patient care physician population.

Although not shown in the table, the supply-price correlations for prices in the aggregate Blue Shield and Medicare B market are quite similar to the corresponding correlations for prices in either the Blue Shield or Medicare B market alone. The single exception is that the correlation of general and family practice physician supplies with the prices of generalists and of primary care physicians is substantially higher for prices in the Blue Shield market than for prices in the Medicare market.

In summary, there clearly are considerable differences between various specialty-oriented cohorts in the relationship that their supplies exhibit with physician prices, whether referring to prices in their own or in other cohorts. Medical specialist supplies in particular are associated with higher prices for physicians of all kinds. The mechanisms at work here are not really clear, but a few conjectures can be made. It can be suggested for instance, that supplies of medical specialists are an instrument of demand creation, generating additional referals to other physicians in certain other cohorts, as well as among themselves, while possibly also tending to create demand for their own services without resort to price-related inducement. Alternatively, since medical specialists are invariably more expensive, it may be that the presence of

relatively greater supplies of them in some communities tends generally to lift the price levels of all. It also must be acknowledged that the statistical associations observed here do not really sort out cause and effect. Hence, as a further alternative possibility, it could be conjectured that medical specialists simply are attracted to places where prices tend generally to be high.

In any event, according to the test of theory against empirical observation suggested by most researchers in the field, the uniformly positive correlations observed here between physician supplies and prices tend to support the physician-induced demand and target income hypotheses. The creation of demand for one's own services, if the phenomenon indeed exists, would appear to be greatest among medical specialists and, to only slightly less extent, among primary care physicians. Surgeons, while exhibiting some evidence of self-induced demand, do not exhibit it nearly as strongly. General and family practice physicians do not exhibit such evidence to any practically significant degree at all, except in the Blue Shield market, and there only modestly.

E. URBAN BIAS

Previous in-house studies at Pennsylvania Blue Shield have indicated that Philadelphia is vastly different from the rest of Pennsylvania in every way. There was, for instance, an in-house study (not documented for publication) that used cluster analysis methods to partition the state into its most naturally disparate geographic subareas on the basis of general demographic and socioeconomic characteristics at the county level.

Cluster analysis, in this kind of application, could be used to partition the state into any desired number of component "clusters" of counties such that, on the basis of several measurable social and economic indicators used to describe each county, the emerging natural clusters of counties would be maximally different from each other, while each component cluster would itself be maximally homogeneous internally. In a two-way partitioning by these methods, Philadelphia County (center city Philadelphia) alone emerged as one cluster, with the other cluster consisting of the remainder of the state, and the Philadelphia cluster extremely distanced from the cluster of all other counties ("distance" in this case being an abstract measure of the degree of dissimilarity). In a three-way partitioning, the clusters emerged as Philadelphia County, Allegheny County (Pittsburgh), and the combination of all remaining counties. In this case, Philadelphia again was extremely distanced from both Pittsburgh and the cluster of all remaining counties, but the distance between Pittsburgh and the rest of the state (other than Philadelphia) was not unusually great. In a four-way partition, the clusters were: (1) Philadelphia; (2) Pittsburgh; (3) a composite of Bucks, Chester, Cumberland, Delaware, and Montgomery Counties; and (4) all other counties. The eastern half of Cumberland county constitutes an essentially residential and rather upgrade suburban area to the state capital, Harrisburg, while large portions of the other four counties in cluster (3) comprise suburban Philadelphia. In this case, center Philadelphia continued to be very greatly distanced, socially and economically, from all three other clusters; but the three clusters after Philadelphia were more modestly and reasonably different from one another.

Using data from the present study, Table 3-14 demonstrates how vastly different Philadelphia is. The table also shows that Allegheny County (Pittsburgh), while different from both Philadelphia County (center Philadelphia) and all the rest of the state, is much more like the rest of the state than Philadelphia. Allegheny easily can be taken as representing a reasonable degree of variation in a reasonable distribution with all other counties; but Philadelphia is so different that it could be considered, for all practical purposes, aberrational -- at least in the context of the social and economical character of the state as a whole.

Considering that almost 2,300, or 23 percent, of the physicians represented in this study are identified as being in Philadelphia County, this may account for the power of the urbanization factor observed earlier. It also prompts one to ask what relationships between physicians' prices and practice locality characteristics might be found for all the rest of the state if one simply removes Philadelphia from the analysis. A revealing preview of the difference this makes is given in Table 3-15, which shows the Pearson correlations of each of our locality variables with the aggregate physicians' price index variable for the state with, and then without, Philadelphia County included. The table further shows the changes in correlation of locality variables with the price variable if Philadelphia and Allegheny both are removed.

Table 3-15 shows very clearly the almost startling difference when Philadelphia County is included or excluded. It can be seen that many factors not only change significantly in the magnitude of their importance, but a number of them even change in the direction of their effect. It also is again seen that the removal of Allegheny in addition

TABLE 3-14. COMPARATIVE LOCALITY CHARACTERISTICS FOR PHILADELPHIA COUNTY (PHILADELPHIA INNER CITY), ALLEGHENY COUNTY (PITTSBURGH), AND REMAINDER OF PENNSYLVANIA

Locality (County) Characteristic	Geographic Area (County)		
	Philadelphia	Allegheny	All Others
Population density	14,147	2,084	701
Percent minorities	34.4%	9.3%	3.1%
Percent aged 65 or older	13.7%	13.1%	11.7%
Per capita income	$3,041	$3,390	$3,182
Percent of families below poverty level	11.2%	7.1%	6.7%
Median school years completed	10.9	12.1	11.8
Percent college graduates in population	6.8%	11.1%	9.5%
Percent laborers in workforce	4.6%	4.9%	4.8%
Percent of workforce unemployed	6.7%	6.1%	5.2%
Percent voted conservative	32.3%	47.7%	52.7%
Consumer price index (CPI)	121.4	119.4	114.0
General hospital beds per 100,000 pop.	653.8	602.2	387.5
Direct patient care phys. per 100,000	111.5	127.5	111.8
Primary care physicians per 100,000	58.7	42.4	49.4
Medical specialists per 100,000	42.7	30.9	22.1
Surgical specialists per 100,000	24.0	37.0	25.8
Mean monthly pay per phys. off. employee	$1,289	$1,658	$1,243
Median monthly contract rent	$110	$119	$115
Blue Shield penetration	74.4%	81.4%	41.8%
Annual Blue Shield payments per capita	$19.43	$25.82	$15.89
Annual Medicare B allowances per capita	$39.01	$22.28	$17.74
State health expenditures per capita	$120.86	$59.31	$50.87

TABLE 3-15. PEARSON CORRELATIONS OF LOCALITY CHARACTERISTICS WITH AGGREGATE PRICE INDEX FOR STATE OF PENNSYLVANIA WITH AND WITHOUT MAJOR URBAN COUNTIES

	Geographic Area Represented		
Locality (County) Characteristic	Entire State	State Less Philadelphia County	State Less Philadelphia & Allegheny County
Population density	.31	.19	.23
Percent minorities	.30	.13	.15
Percent aged 65 or older	.09	-.05	-.08
Per capita income	.13	.23	.24
Percent of families below poverty level	.07	-.21	-.23
Median school years completed	-.10	.18	.20
Percent college graduates in population	.05	.21	.22
Percent laborers in workforce	-.18	-.21	-.23
Percent of workforce unemployed	.09	-.06	-.07
Percent voted conservative	-.25	-.03	-.02
Consumer price Index (CPI)	.31	.23	.27
General hospital beds per 100,000 pop.	.14	-.03	-.06
Direct patient care phys. per 100,000	.14	.20	.21
Primary care physicians per 100,000	.23	.17	.20
Medical specialists per 100,000	.30	.22	.24
Surgical specialists per 100,000	.12	.19	.20
Mean monthly pay per phys. off. employee	.05	.09	.09
Median monthly contract rent	.16	.24	.26
Blue Shield penetration	.17	.05	.03
Annual Blue Shield payments per capita	.13	.13	.14
Annual Medicare B allowances per capita	.32	.22	.23
State health expenditures per capita	.22	-.00	-.01

to Philadelphia makes some, but comparatively little, additional difference. Clearly, the inclusion of central Philadelphia adds a significant major urban bias to the study. Thus, by removing Philadelphia County from the analysis, there may result a much better and more representative picture of the true relationship between physicians' prices and locality factors -- at least a better picture of relationships existing everywhere outside the comparatively super-sized major urban center.

F. PRICES AND LOCALITY FACTORS OUTSIDE CENTRAL PHILADELPHIA

The distributions of locality characteristics over physician quintiles by aggregate relative price, with Philadelphia County omitted, are shown in Table 3-16. This is the counterpart to Table 3-11, which earlier was shown and discussed for parallel results with Philadelphia County included. Comparing Table 3-16 with Table 3-11, some substantial and important changes indeed are found after removing center city Philadelphia from the analysis. The changes obtained by removing this major urban center are summarized below (with eta-square changes in parentheses):

- o <u>Factors Decreasing in Importance</u>

  Population density (.090 to .043)

  Percent minorities in population (.087 to .025)

  Political orientation (.059 to .003)

TABLE 3-16. MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, PHILADELPHIA COUNTY OMITTED

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	668	842	1,005	1,116	1,199	.043	
Percent minorities	3.3%	4.0%	4.4%	4.7%	4.7%	.025	
Percent ages 65 or older	12.0%	12.0%	12.0%	11.9%	11.8%	.002	.004
Per capita income	$3,016	$3,169	$3,257	$3,334	$3,409	.057	
Percent of families below poverty level	7.6%	6.9%	6.6%	6.3%	6.0%	.049	
Median school years completed	11.75	11.85	11.89	11.96	12.02	.036	
Percent college graduates in population	8.6%	9.4%	10.0%	10.5%	11.1%	.043	
Percent laborers in workforce	5.2%	4.9%	4.7%	4.6%	4.4%	.046	
Percent of workforce unemployed	5.5%	5.3%	5.3%	5.3%	5.2%	.006	
Percent of voted conservative	52.4%	51.8%	51.6%	51.4%	51.7%	.003	.001
Consumer price index (CPI)	113.3	114.6	115.4	115.9	116.2	.067	

*Significant at .001 level unless shown otherwise.

TABLE 3-16. MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, PHILADELPHIA COUNTY OMITTED (Con't)

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	425.3	427.6	429.9	427.0	406.5	.002	.008
Direct patient care phys. per 100,000	101.1	111.1	117.2	122.3	127.0	.045	
Primary care physicians per 100,000	44.8	47.2	48.9	50.0	51.7	.033	
Medical specialists per 100,000	19.0	22.4	24.7	26.3	27.7	.057	
Surgical specialists per 100,000	22.7	26.3	28.5	30.7	32.6	.039	
Mean monthly pay per phys. off. employee	$1,273	$1,319	$1,325	$1,343	$1,337	.010	
Median monthly contract rent	$105	$113	$118	$123	$129	.059	
Health Insurance and Subsidization:							
Blue Shield penetration	45.4%	48.6%	50.4%	50.6%	48.8%	.008	
Annual Blue Shield payments per capita	$15.26	$17.43	$18.27	$18.96	$18.99	.028	
Annual Medicare B allowances per capita	$16.12	$17.99	$19.03	$19.93	$20.63	.057	
State health expenditures per capita	$53.80	$51.11	$51.71	$52.47	$52.56	.001	.070

*Significant at .001 level unless shown otherwise.

CPI (.103 to .067)

Hospital bed supply (.016 to .002)

Primary care physician supply (.057 to .033)

Medical specialist supply (.099 to .057)

Blue Shield market penetration (.030 to .008)

Medicare Part B allowances per capita (.105 to .057)

State medical expenditures per capita (.046 to .001)

o Factors Increasing in Importance

Per capita income (.029 to .057)

Percent families under poverty level (.013 to .049)

Median school years completed (.015 to .036)

Percent college graduates in population (.011 to .043)

Direct patient care physician supply (.031 to .045)

Surgical specialist supply (.022 to .039)

Median contract rent (.034 to .059)

o Factors Showing Little Change

Percent aged persons in population (.009 to .002)

Percent laborers in workforce (.041 to .046)

Percent workforce unemployed (.011 to .006)

Physicians' office salary costs (.006 to .010)

Blue Shield payments per capita (.028 to .028)

The pattern of specific changes identified above suggests the following generalizations when Philadelphia is omitted:

(1) The influence of urbanization, while still of some moderate importance, is greatly diminished.

(2) Indicators of consumer economic strength and purchasing power (i.e., consumer demand) become relatively more important.

(3) Education, where the proportion of college graduates in particular may be taken as an indicator of a population that socially is relatively upgrade, increases from little importance to at least moderate importance.

(4) Supplies of medical specialists and primary care physicians, while continuing to be of some importance, fall to a comparatively less dominant position. At the same time, overall physician supply becomes relatively more important.

(5) Practice costs, as represented by rents, nearly double in importance. Office staff costs, on the other hand, remain of little consequence.

(6) Blue Shield market penetration and the influx of state money for medical care almost disappear as factors of any importance. Input of Medicare Part B money to the local medical economy continues to be a factor of some importance, but at a reduced level. Input of money from Blue Shield benefit payments holds steady as a factor of modest importance.

In the revised picture for the entire state outside of central Philadelphia, the most important specific factors then appear to be (in this order, with eta-squares in parentheses): the locally projected CPI (.067); rental costs for space (.059); per capita income (.057); per capita Medicare Part B allowances (.057); supply of medical specialists (.057); proportion of poverty families (.049); proportion of laborers in the workforce (.046); supply of all direct patient care physicians (.045); population density (.043); proportion of college graduates in the population (.043); supply of surgical specialists (.039); median school years completed (.036); and supply of primary care physicians (.033). Physicians' prices here appear to be most significantly influenced by the underlying inflation rate, by certain operating costs (at least as represented by rents), by consumer purchasing power as an instrument of demand creation, by the input of Medicare money into the local medical services economy, and by physician supplies. The supply of medical specialists continues to be the most important facet of physician supply, but outside of Philadelphia the overall direct patient care physician supply becomes more important than primary care physician supply. Additional influences that appear to be moderately important in relation to physicians' price levels outside of central Philadelphia are urbanization and a socially upgrade population. All of these influences are related positively to physicians' relative price levels. The proportion of laborers in the workforce also continues to show relationship to physicians' price levels at approximately the same moderate strength of association, whether with or without central

Philadelphia in the analysis, again prompting speculation that this may be a disguised cultural influence factor.

Similar kinds of data and information are presented in Tables 3-17(a) through (d) for specific broad specialty-oriented cohorts throughout the state, with central Philadelphia excluded. These tables parallel Tables 3-12(a) through (d), which earlier presented corresponding findings with all of Philadelphia included. In general, the findings for most of these specialty-oriented cohorts reflect the same kinds of changes as were observed for the overall physician sample: reduced importance for urbanization factors and for medical specialist supply, but increased importance for conventional demand generating and cost factors.

As before, general and family practitioners' prices are found to be related to a rather large number of factors. The most important specific factors are (in this order, with eta-squares in parentheses): medical specialist supply (.061); Medicare B allowances per capita (.056); population density (.055); proportion of families under poverty level (.050); direct patient care physician supply (.049); percent college graduates in population (.049); percent laborers in workforce (.047); and median school years completed (.045). It can be seen that, after excluding central Philadelphia from the analysis, a relatively greater influence is found for classical economic factors such as rents and population income levels. Education factors and the proportion of families under the poverty level show dramatically increased importance in relation to generalist physicians' prices. Higher prices for generalists are found in association with greater local inflationary pressures, higher rents, greater consumer purchasing strength, greater supplies of

TABLE 3-17(a). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL) BY AGGREGATE PRICE INDEX QUINTILES, FOR GENERAL AND FAMILY PRACTICE PHYSICIANS ONLY, PHILADELPHIA COUNTY OMITTED

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics:	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	566	782	960	1,078	1,213	.055	
Percent minorities	2.9%	3.6%	4.1%	4.3%	4.5%	.032	
Percent aged 65 or older	12.0%	11.9%	11.8%	11.6%	11.5%	.004	.020
Per capita income	$2,982	$3,175	$3,271	$3,368	$3,389	.064	
Percent of families below poverty level	7.6%	6.8%	6.4%	6.1%	6.0%	.050	
Median school years completed	11.70	11.82	11.89	11.99	12	.045	
Percent college graduates in population	8.3%	9.3%	10.0%	10.9%	11.1%	.049	
Percent laborers in workforce	5.2%	4.8%	4.6%	4.4%	4.4%	.047	
Percent of workforce unemployed	5.5%	5.3%	5.2%	5.3%	5.3%	.006	.003
Percent voted conservative	52.7%	52.4%	51.9%	51.6%	51.7%	.004	.036
Consumer price index (CPI)	112.8	114.3	115.1	115.7	116.0	.072	

*Significant at .001 level unless shown otherwise.

TABLE 3-17(a). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL) BY AGGREGATE PRICE INDEX QUINTILES, FOR GENERAL AND FAMILY PRACTICE PHYSICIANS ONLY, PHILADELPHIA COUNTY OMITTED (Con't)

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics:	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	403.8	395.0	400.6	402.8	398.2	.000	.873
Direct patient care phys. per 100,000	97.3	109.5	115.8	122.2	124.1	.049	
Primary care physicians per 100,000	33.8	47.9	49.5	51.0	51.9	.035	
Medical specialists per 100,000	17.6	21.5	24.0	26.1	26.9	.061	
Surgical specialists per 100,000	20.8	25.1	27.6	30.6	31.3	.044	
Mean monthly pay per phys. off. employee	$1,237	$1,287	$1,303	$1,307	$1,292	.014	
Median monthly contract rent	$103	$113	$120	$128	$131	.072	
Health Insurance and Subsidization:							
Blue Shield penetration	42.9%	45.8%	46.3%	44.8%	43.1%	.005	.012
Annual Blue Shield payments per capita	$14.13	$16.63	$17.42	$17.55	$17.51	.028	
Annual Medicare B allowances per capita	$15.39	$17.66	$18.78	$19.62	$19.80	.056	
State health expenditures per capita	$54.47	$49.88	$50.30	$51.05	$52.95	.004	.035

*Significant at .001 level unless shown otherwise.

TABLE 3-17(b). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR MEDICAL SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	986	971	1,051	1,199	1,181	.011	.001
Percent minorities	4.6%	4.7%	4.9%	5.1%	4.6%	.003	.315
Percent aged 65 or older	12.2%	12.2%	11.9%	12.0%	11.7%	.015	
Per capita income	$3,162	$3,207	$3,313	$3,381	$3,481	.040	
Percent of families below poverty level	7.0%	7.0%	6.4%	6.3%	5.7%	.042	
Median school years completed	11.9	11.9	11.9	12.0	12.0	.017	
Percent college graduates in population	9.4%	9.7%	10.4%	10.8%	11.6%	.036	
Percent laborers in workforce	5.0%	4.9%	4.7%	4.5%	4.3%	.049	
Percent of workforce unemployed	5.5%	5.4%	5.2%	5.2%	5.2%	.014	
Percent voted conservative	51.3%	51.4%	51.7%	52.0%	52.0%	.003	.347
Consumer price index (CPI)	115.0%	115.2%	115.7%	116.2%	116.4%	.020	

*Significant at .001 level unless shown otherwise.

TABLE 3-17(b). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR MEDICAL SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED (Con't)

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	465.0	472.2	432.1	432.2	400.0	.022	
Direct patient care phys. per 100,000	112.2	116.5	121.8	126.9	132.1	.026	
Primary care physicians per 100,000	46.0	47.3	49.9	51.1	53.4	.036	
Medical specialists per 100,000	23.0	24.6	26.4	27.8	29.3	.028	
Surgical specialists per 100,000	27.3	29.0	30.5	32.7	34.7	.020	
Mean monthly pay per phys. off. employee	$1,356	$1,354	$1,446	$1,354	$1,323	.003	.273
Median monthly contract rent	$111	$114	$120	$124	$133	.053	
Health Insurance and Subsidization:							
Blue Shield penetration	51.3%	53.3%	52.7%	51.6%	49.4%	.004	.164
Annual Blue Shield payments per capita	$17.87	$18.77	$19.26	$19.29	$19.26	.004	.111
Annual Medicare B allowances per capita	$18.06	$18.98	$19.57	$20.51	$21.18	.029	
State health expenditures per capita	$52.61	$53.83	$52.30	$52.82	$50.62	.002	.563

*Significant at .001 level unless shown otherwise.

TABLE 3-17(c). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR SURGICAL SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	670	838	1,016	1,085	1,226	.039	
Percent minorities	3.4%	4.2%	4.6%	4.9%	4.8%	.020	
Percent aged 65 or older	12.1%	11.9%	12.2%	12.1%	11.9%	.004	.039
Per capita income	$2,980	$3,112	$3,191	$3,269	$3,345	.048	
Percent of families below poverty level	7.9%	7.1%	6.9%	6.6%	6.2%	.051	
Median school years completed	11.8	11.9	11.9	11.9	12.0	.026	
Percent college graduates in population	8.6%	9.3%	9.6%	10.1%	10.7%	.030	
Percent laborers in workforce	5.3%	5.1%	4.9%	4.7%	4.5%	.052	
Percent of workforce unemployed	5.6%	5.4%	5.5%	5.4%	5.3%	.008	.001
Percent voted conservative	52.2%	51.1%	51.2%	50.8%	51.3%	.005	.023
Consumer price index (CPI)	113.3%	114.5%	115.3%	115.8%	116.2%	.056	

*Significant at .001 level unless shown otherwise.

TABLE 3-17(c). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR SURGICAL SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED (Con't)

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	447.6	453.7	460.0	445.3	416.2	.008	.001
Direct patient care phys. per 100,000	101.7	108.5	113.8	118.8	122.1	.031	
Primary care physicians per 100,000	43.6	44.9	47.3	48.5	50.0	.032	
Medical specialists per 100,000	19.0	21.8	23.9	25.3	26.4	.041	
Surgical specialists per 100,000	23.4	26.0	27.4	29.5	30.6	.022	
Mean monthly pay per phys. off. employee	$1,290	$1,352	$1,345	$1,356	$1,354	.008	.001
Median monthly contract rent	$104	$110	$113	$118	$125	.047	
Health Insurance and Subsidization:							
Blue Shield penetration	46.8 %	50.0%	52.0%	53.3%	49.6%	.001	
Annual Blue Shield payments per capita	$15.93	$17.69	$18.05	$19.42	$18.95	.019	
Annual Medicare B allowances per capita	$16.32	$17.54	$18.67	$19.70	$20.21	.046	
State health expenditures per capita	$53.38	$51.62	$51.98	$53.65	$53.32	.001	.581

*Significant at .001 level unless shown otherwise.

TABLE 3-17(d). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR OTHER SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED

Locality (County) Characteristics	Physician Price Index (AGINDEX) Quintiles Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
General Demographic/Socioeconomic:							
Population density	786	956	1,014	1,028	1,108	.013	.272
Percent minorities	3.7%	4.4%	4.2%	4.0%	4.3%	.005	.735
Percent aged 65 or older	12.1%	12.4%	12.0%	11.4%	11.9%	.038	.004
Per capita income	$3,074	$3,244	$3,343	$3,375	$3,499	.050	
Percent of families below poverty level	7.4%	7.0%	6.1%	5.7%	5.9%	.070	
Median school years completed	11.86	11.84	11.88	11.96	11.98	.014	.232
Percent college graduates in population	9.2%	9.5%	10.2%	10.6%	11.3%	.032	.011
Percent laborers in workforce	5.0%	4.8%	4.6%	4.5%	4.4%	.027	.024
Percent of workforce unemployed	5.5%	5.4%	5.2%	4.9%	5.2%	.024	.040
Percent voted conservative	52.5%	51.1%	51.5%	51.8%	52.4%	.007	.597
Consumer price index (CPI)	113.8%	115.5%	115.9%	115.8%	116.3%	.046	

*Significant at .001 level unless shown otherwise.

TABLE 3-17(d). MEAN CHARACTERISTICS OF PRACTICE LOCALES (COUNTY LEVEL), BY AGGREGATE PRICE INDEX QUINTILES, FOR OTHER SPECIALISTS ONLY, PHILADELPHIA COUNTY OMITTED (Con't)

	Physician Price Index (AGINDEX) Quintiles						
Locality (County) Characteristics	Q1	Q2	Q3	Q4	Q5	Eta-Squared	Sig.*
Medical Service Supply and Cost Factors:							
General hospital beds per 100,000 pop.	446.4	436.2	410.3	380.0	391.3	.017	.149
Direct patient care phys. per 100,000	106.8	121.2	125.8	120.8	137.7	.044	
Primary care physicians per 100,000	45.3	50.8	50.9	50.5	54.6	.041	.002
Medical specialists per 100,000	20.8	25.2	27.0	25.3	30.1	.043	
Surgical specialists per 100,000	25.7	29.5	31.9	29.0	37.5	.041	.002
Mean monthly pay per phys. off. employee	$1,318	$1,312	$1,298	$1,341	$1,369	.012	.300
Median monthly contract rent	$109	$114	$122	$126	$131	.046	
Health Insurance and Subsidization:							
Blue Shield penetration	48.0%	51.0%	55.5%	50.4%	50.4%	.012	.280
Annual Blue Shield payments per capita	$16.78	$18.88	$20.37	$19.44	$20.29	.022	.059
Annual Medicare B allowances per capita	$17.46	$19.99	$20.36	$19.50	$21.90	.044	
State health expenditures per capita	$51.29	$49.30	$55.56	$48.96	$55.61	.017	.139

*Significant at .001 level unless shown otherwise.

physicians (especially medical specialists), greater amounts of Medicare Part B money entering the local medical economy, more urbanization, and populations that are in general more socially and economically upgrade. It may be speculated that the lower price levels associated with places where there are proportionately more poverty families also could be a reflection of physicians responding to need, possibly discriminating with lower prices for those with lesser financial resources.

For the cohort of medical specialists, the changes resulting from omission of central Philadelphia are quite dramatic. The most important factors (and eta-squares) for medical specialists with Philadelphia excluded are: contract rents (.053); percent laborers in workforce (.049); percent of families below poverty level (.042); per capita income (.041); primary care physician supply (.036); and percent college graduates in the population (.036). Medical specialists' relative price levels also are seen to relate mildly to Medicare B payments per capita (.029); medical specialist supply (.028), and the supply of all direct patient care physicians (.026). Without central Philadelphia, the importance of rents and of consumer purchasing power goes up sharply. At the same time, urbanization and the input of state money to the local medical economy practically disappear as factors related to medical specialists' prices. The input of Medicare B money locally, the supply of medical specialists, and the locally projected CPI, while remaining as factors of at least some importance, are greatly diminshed as important factors. Compared to general and family practice physicians, medical specialists' prices relate to fewer factors and tend to be less strongly related to most factors. Higher prices for medical specialists in

Pennsylvania outside central Philadelphia primarily are associated with higher rents, greater proportions of laborers in the workforce, and greater consumer purchasing power. Somewhat more weakly, higher medical specialist prices also are associated with greater supplies of physicians (especially primary care physicians), better education and socially upgrade populations, and greater inputs of Medicare B money to local physicians' services markets.

For surgical specialists, with central Philadelphia excluded, the most important factors (and their eta-squares) are: locally projected CPI (.056); percent laborers in workforce (.052); percent of families under poverty level (.051); per capita income (.048); contract rents (.047); Medicare B allowances per capita (.046); medical specialist supply (.041); population density (.039); supply of primary care physicians (.032); supply of all direct patient care physicians (.031); and percent of college graduates in the population (.030). With central Philadelphia excluded, consumer purchasing power, rent costs, and education factors become comparatively much more important. The locally projected CPI, population density, and local inputs of Medicare B money, while still of some importance, are substantially less important. Supplies of medical specialists and primary care physicians, while retaining at least a modest degree of influence, also have less strength as factors related to surgeons' prices. The supply of all direct patient care physicians has slightly increased importance, but still is not a very strong factor. Input of state money to the local medical services economy, which is a relatively important factor with central Philadelphia included, becomes insignificant when Philadelphia County is excluded. In general, higher

prices for surgeons' services are associated with greater underlying inflationary pressure, larger proportions of laborers in the workforce, greater consumer purchasing power, higher rents, more Medicare B money in the local medical services economy, greater physician supplies (especially primary care and medical specialist physicians), greater urbanization, and socially more upgrade populations.

For physicians in "other" specialties outside central Philadelphia, the most important factors are: percent of families under the poverty level (.070); per capita income (.050); the locally projected CPI (.046); Medicare Part B allowances per capita (.044); physician supplies, measured in any way (ranging from .041 to .044); the proportion of the population aged 65 or older (.038); and the percent college graduates in the population (.032). Compared to the results with central Philadelphia included, this represents greatly increased significance for consumer purchasing power as a factor. The proportions of aged and college educated people in the population, which had little or no significance with Philadelphia included, increase to at least a modest degree of importance. The CPI and Medicare B allowances per capita, although diminished, still have a moderate degree of importance. While the importance of medical specialist supplies is reduced, the relative importance of surgeon and direct patient care physician supplies is increased, with the net result that all measures of physician supply have a rather uniform and somewhat moderate degree of importance. Urbanization and the local inputs of state money essentially disappear as important factors. Higher prices for "other" specialists outside central philadelphia then are associated with greater consumer purchasing power,

greater underlying inflationary pressures, larger inputs of Medicare B money to the local economy, larger supplies of physicians of any kind, greater proportions of aged people, and better educated and socially upgrade populations.

Finally, Table 3-18 is a revised version of what was presented earlier as Table 3-13. The revised table shows Pearson correlations for supplies of physicians in various broad specialty-oriented cohorts with physician prices in all of the same cohorts, with Philadelphia County physicians excluded. In comparing Table 3-18 with the earlier Table 3-13, it can be seen that the correlations of all cohort prices with supplies of surgeons, supplies of "other" specialists, and supplies of all direct patient care physicians are higher after center city Philadelphia physicians are deleted. Correlations with supplies of primary care physicians and medical specialists, on the other hand, are lower, while correlations with supplies of generalist physicians remain approximately the same. There clearly is a diminution of the uniquely dominant position of medical specialists which had been observed earlier with all Philadelphia physicians included. Supplies of general and family practice physicians continue to have little relationship to prices in most cohorts. (As before, although not reflected in the table, the correlations of generalist physician supplies with prices in both their own and other cohorts are higher in the Blue Shield market than in the Medicare market.) Most significantly, all of the correlations continue to be positive, again supporting the physician-induced demand and target income hypotheses.

TABLE 3-18. CORRELATION OF PHYSICIANS' AGGREGATE RELATIVE PRICE LEVELS WITH PHYSICIAN SUPPLY FOR SELECTED SPECIALTY GROUP COHORTS, PHILADELPHIA COUNTY OMITTED

Supply of:	Pearson Correlation with Aggregate Price Indexes for: All DPC Phys.	GP/FP	Primary Care	Medical Spec.	Surgical Spec.	Other Spec.
All Direct Patient Care (DPC) Physicians	.20	.20	.20	.17	.17	.14
General & Family Practice Physicians	.04	.03	.04	.14	.06	.08
Primary Care Physicians	.17	.17	.17	.19	.17	.12
Medical Specialists	.22	.23	.22	.17	.19	.13
Surgical Specialists	.19	.19	.19	.15	.15	.14
Other Specialists	.19	.19	.19	.16	.15	.14

VI. FINDINGS: MULTIVARIATE ANALYSIS

The one-way analysis of variance (ANOVA) findings presented and discussed in the preceding two sections brought forth a number of interesting observations and conjectures concerning the relationships of physicians' prices to various kinds of possible price-explanatory variables. The ANOVA approach, by simplifying the analysis to an examination of one factor at a time, can be quite helpful in providing a general orientation to some possibly significant relationships the price variable may have with other factors in the overall data set. As pointed out previously, however, the ANOVA approach also admits a certain degree of hazard that the true relationships which some of the possible explanatory factors have to the price variable may be misread. To sharpen the analysis, a multivariate approach should be used to take the effects of many different explanatory factors into account simultaneously.

The tool used here for that purpose is stepwise ordinary least squares (OLS) regression, from which reduced form price equations are obtained. These are logarithmic regressions, in which the dependent price variables and all of the independent variables (except dichotomous 0-1 variables) have been transformed to their natural logarithms. This then permits the regression coefficients on all continuous variables to be interpreted as elasticities and, further, permits the regression coefficients on all dichotomous variables to be interpreted as the proportion by which the price response is incremented for those who are coded "1" in the dichotomization, ceteris paribus. In addition, all variables representing monetary value have been deflated by the locally

projected CPI for the physician's practice locale, to make the data for individual physicians practicing in different localities more validly comparable in a cross-sectional analysis. Regression results have been generated for a full factorial design encompassing three different markets (Blue Shield, Medicare B, and the aggregate market for Blue Shield and Medicare B combined); four different types of physician cohorts (all direct patient care physicians, primary care physicians, medical specialists, and surgical specialists); and two geographic domains, defined by either including or excluding center city Philadelphia with the rest of the state (motivated by the distinctiveness of central Philadelphia pointed out in Section V.E).

As before, the dependent variables are cross-sectional price indexes at the individual physician level, representing each physician's relative pricing position compared to statewide average prices of other doctors who perform the same services. Three different dependent variables are used: BSINDEX, representing the physician's relative price position in the statewide Blue Shield market for physicians' services; MBINDEX, representing the physician's relative price position in the statewide Medicare Part B market; and AGINDEX representing the physician's relative price position in the aggregate Blue Shield and Medicare Part B market.

Independent variables used in these regressions are identified and defined below:

DEGREE	Dummy variable coded 1 if the physician is an M.D. or 0 if the physician is a D.O.
MEDSPEC	Dummy variable coded 1 if the physician is a medical specialist; 0 otherwise.

SURGSPEC	Dummy variable coded 1 if the physician is a surgical specialist; 0 otherwise.
BOARD	Dummy variable coded 1 if the physician is board certified; 0 otherwise.
FMG	Dummy variable coded 1 if the physician is a foreign medical graduate (FMG); 0 if the a U.S. medical graduate.
ASSNMEM	Dummy variable coded 1 if the physician has membership in his national professional association (AMA or AOA); 0 otherwise.
ASSOC	Dummy variable coded 1 if the physician practices in association with at least one other physician; 0 if solo.
AGE	Physician's age.
POPDENSE	Population density of county in which physician practices.
PCINC	CPI-deflated per capita income for county in which physician practices.
GPPOP	Supply of general practice and family practice physicians per 100,000 population in county of practice.
PRIMEPOP	Supply of primary care physicians per 100,000 population in county of practice. Primary care physicians here are defined to encompass general practitioners, family practice physicians, internists, and pediatricians.
MDSPPOP	Supply of medical specialists per 100,000 population in county of practice.
MSPECPCT	Proportion of medical specialists relative to overall direct patient care physician supply in county of practice.
INSMONY	CPI-deflated total annual dollar volume of health insurance moneys from Blue Shield payments, Medicare Part B allowances, and state-related sources entering the local physicians' services market in the county of practice.

Several additional potentially meaningful variables available in the overall data set developed for this project have been left out, due to multicollinearities with some of the included variables and with each other. These include, for example, the median contract rent, the proportion of persons of minority race in the population, and the proportion of the population aged 65 or over in the county of practice. In addition, the supply of general hospital beds relative to population was left out as a factor because it had a slight destabilizing effect on some of the regressions, and also because its contribution was negligible or not statistically significant in test runs where it was tried. The remaining included variables for the regressions constitute at least a minimal data set encompassing both demand side and supply side variables. The operative physician supply variables of course are changed for regressions involving different cohorts of physicians.

Finally, it may perhaps be noticed that the number of physicians reflected in the degrees of freedom for these regressions are generally fewer than the numbers of physicians cited earlier as being represented in the data base. This is simply a matter of some physicians falling out of the analysis due to missing data items.

A. FINDINGS FOR THE OVERALL PHYSICIAN POPULATION

Coefficients of the reduced form price equations for the overall physician sample are displayed in Table 3-19. Separate sets of results have been generated for the state with and without center city Philadelphia (Philadelphia County). As noted above, this distinction was

TABLE 3-19. PRICE REGRESSION COEFFICIENTS: PENNSYLVANIA WITH AND WITHOUT CENTRAL PHILADELPHIA, BY INSURED MARKET, ALL DIRECT PATIENT CARE PHYSICIANS

	Entire State			Central Philadelphia Excluded		
	Agg.	Blue Sh.	Med. B	Agg.	Blue Sh.	Med B.
DEGREE	-.0564	-.1002	-.0378	-.0678	-.1040	-.0481
	(.0094)	(.0103)	(.0103)	(.0108)	(.0120)	(.0118)
MEDSPEC	.1254	.1192	.1275	.1276	.1236	.1296
	(.0071)	(.0078)	(.0078)	(.0078)	(.0087)	(.0086)
SURGSPEC	.0991	.0911	.1107	.1010	.0965	.1114
	(.0071)	(.0078)	(.0078)	(.0076)	(.0085)	(.0083)
BOARD	.0596	.0385	.0819	.0438	.0245	.0679
	(.0061)	(.0066)	(.0067)	(.0067)	(.0075)	(.0074)
FMG	.0553	.0509	.0530	.0523	.0495	.0488
	(.0088)	(.0096)	(.0097)	(.0098)	(.0109)	(.0107)
ASSNMEM	-.0361	-.0429	-.0364	-.0440	-.0481	-.0448
	(.0072)	(.0078)	(.0079)	(.0084)	(.0093)	(.0091)
ASSOC	.0353	.0323	.0325	.0102	.0106	.0141*
	(.0087)	(.0095)	(.0095)	(.0108)	(.0121)	(.0118)
AGE	-.1948	-.2130	-.1968	-.1846	-.2100	-.1781
	(.0129)	(.0141)	(.0141)	(.0142)	(.0158)	(.0155)
POPDENSE	.0166	.0136	.0179	.0010	-.0030	.0031*
	(.0030)	(.0033)	(.0033)	(.0040)	(.0045)	(.0044)
PCINC	.0072*	**	**	.1453	.1464	.1295
	(.0226)			(.0321)	(.0357)	(.0350)
GPPOP	.1010	.1062	.0969	.0616	.0663	.0599
	(.0132)	(.0134)	(.0135)	(.0143)	(.0160)	(.0157)
MSPECPCT	.0275	.0217	.0352	.0151*	.0081	.0235
	(.0104)	(.0109)	(.0109)	(.0104)	(.0116)	(.0114)
INSMONY	.0118*	.0165*	.0049*	.0049*	.0080	-.0014*
	(.0098)	(.0100)	(.0100)	(.0096)	(.0107)	(.0105)
Constant	4.6138	4.7403	4.7172	3.745	3.8338	3.8667
R^2	.2382	.1942	.2303	.1975	.1667	.1893
F	141.39	118.11	146.64	86.17	70.07	81.76
Degrees of Freedom	13/5,880	13/5,880	13/5,880	13/4,553	13/4,553	13/4,553

Standard errors in parenthesis.

* Not significant at .05 level.
**Not significant enough to be included in equation.

motivated by the findings reported and discussed in sections V.E and V.F, illustrating that Philadelphia is markedly different from the rest of the state of Pennsylvania, and that significantly different results are obtained depending upon whether central Philadelphia is included or excluded. Within each of these differently defined geographic domains, separate sets of results also are shown for the Blue Shield market, the Medicare Part B market, and the aggregate market obtained by combining the two.

The constants in these equations indicate that the estimates resulting from the regressions are reasonably close to the mean for the state as a whole, but that they are a bit low for the state when Philadelphia is excluded. For the entire state, these regressions explain up to 24 percent of the variance in the dependent price variable. The variance explanation is somewhat less, however, for the runs which excluded Philadelphia. It also may be noted that the variance explanation is a bit less for the Blue Shield market than for the Medicare or aggregate markets. The R^2 for these regressions is of a size generally consistent with and representative of the results usually obtained in this kind of work with data at the individual physician level.

It is seen that M.D. (as compared to D.O.) physicians have prices that are 5.6 percent lower in the aggregate market, 10.0 percent lower in the Blue Shield market, and 3.8 percent lower in the Medicare market. Also, the return for specialty credentials or status is clearly demonstrated. Medical specialists are seen to have prices that are in the range of 12 to 13 percent higher than those of all other physicians combined; and surgical specialists have prices in the range of 9 to 11

percent higher. Board certification credentials also bring a higher return in terms of prices commanded by physicians holding such credentials. As noted earlier in the ANOVA results, the impact of board certification upon physicians' prices is substantially greater in the Medicare market than in the Blue Shield market -- actually more than twice as great, with increases ranging from 2.5 to 3.9 percent under Blue Shield, compared to increases of 6.8 to 8.2 percent under Medicare B. It also is apparent that board certification credentials are worth more in Philadelphia than in the rest of the state, as the coefficient for BOARD becomes smaller when Philadelphia is excluded from the analysis. In the aggregate market, board certified physicians command prices that are 6.0 percent higher when Philadelphia is included, or 4.4 percent higher when Philadelphia is not included. FMG physicians have prices approximately five percent higher in all markets, whether Philadelphia is included or not. Membership in the American Medical Association (AMA) or American Osteopathic Association (AOA) is associated with prices that in general are four to five percent lower. Physicians who practice with at least one associate have prices that are approximately three percent higher than the prices of solo practitioners in all markets when central Philadelphia is included; but, without Philadelphia, the coefficients of the dummy variable differentiating solo practice or practice with associates becomes small and insignificant in all markets.

The findings again confirm that physicians' prices are negatively related to their ages. For every 10 percent increase (decrease) in the physician's age, there is a two percent decrease (increase) in relative price level (at the mean).

The regression coefficients for population density and per capita income are positive, but quite small and often not significant. the elasticities indicate a change of less than one percent in price for every ten percent change in either of these factors. The variable for inputs of health insurance monies is not statistically significant in any case examined. The physician supply variables used here are the supply of general and family practitioners relative to population, and the proportion of all direct patient care physicians who are medical specialists. These results show elasticities of physician prices with respect to GP/FP supplies that are in the neighborhood of .10 when Philadelphia is included, and in the neighborhood of .06 when Philadelphia is excluded. The impact of proportion of medical specialists in the physician supply is very small, and outside of central Philadelphia is insignificant. In preliminary trial run regressions, variables for supplies of surgeons and of all direct patient care physicians also were tried, but did not work well.

To sum up, credentialing -- as reflected by specialty status and board certification -- does bring a positive return (i.e., higher fees), which is consistent with the idea that credentialing represents greater product quality and should act as a positive demand-related factor. Quantitatively, specialty status brings approximately the same reward in all markets, either with or without Philadelphia included in the geographic domain of the market. Board certification credentials, however, are seen quite clearly to be worth more in central Philadelphia, as the coefficient for BOARD is about 36 percent larger for the state with Philadelphia included than it is without Philadelphia.

Other factors commonly thought to be components of the quality of physician services have effects in a direction opposite to that which would be predicted. In particular, FMGs are seen to have uniformly higher prices, which is contrary to the general set of assumptions that FMGs do not have the same quality of training as U.S. medical graduates, that their services therefore are inferior goods, and that FMG status therefore should act as a negative demand factor. Similarly, D.O. physicians -- as contrasted to M.D. physicians -- often are perceived as having lower quality medical training and therefore as delivering a lower quality of care (a perception which may or may not be justified); but contrary to the negative demand impact and lower price level which this theoretically would point to in most competitive market models, the D.O. physician is observed to have higher price levels than the M.D.

Socioeconomic variables that should act as demand factors are uniformly positive, but tend in most contexts to be small and often are not statistically significant. Population density, for instance, is a statistically significant but generally small factor in the state as a whole. When central Philadelphia is not included, population density becomes an insignificant factor for the remainder of the state. Conversely, population income is a significant factor with a comparatively large coefficient for the state outside of central Philadelphia, but becomes statistically not significant when all of Philadelphia is included in the data base. The price-related impact of health insurance monies entering local physician services markets is generally positive but not statistically significant in any context for the overall physician population.

The price response to increased physician supplies is positive but comparatively modest when measured in terms of supplies of general and family practice physicians relative to population. The supply of medical specialists, measured in terms of their proportional representation in the overall direct patient care physician population, tends to have even smaller impact. As a rule, the physician supply variable should be selected and defined so as to capture potentially competing providers of care as fully as possible. In the present instance, relative to prices in the overall physician population, the most naturally appealing variable for this purpose would seem to be the supply of all direct patient care physicians. As pointed out earlier, however, this supply variable could not be used because it had a destablizing influence on the regressions when tried. The quantitative impact of the GP/FP and medical specialist supply variables used here varies depending upon whether central Philadelphia is or is not included. For the state as a whole, with all of Philadelphia included, the elasticity of physicians' prices with respect to generalist physician supplies is in the neighborhood of .10; and the elasticity with respect to proportional supplies of medical specialists is in the neighborhood of .03. With center Philadelphia excluded, the elasticity of price with respect to generalist physician supplies drops to approximately .06. The elasticity relative to proportional supply of medical specialists concurrently drops to just barely more than .02 in the Medicare market, and less than .01 in the Blue Shield market.

B. FINDINGS FOR SELECTED BROAD SPECIALTY-ORIENTED COHORTS

In this section, findings similar to those reported above for the overall physician population are given for selected specialty-oriented cohorts of physicians -- specifically, the cohorts of primary care physicians, medical specialists, and surgical specialists. Primary care physicians here are defined as general practitioners, family practice physicians, pediatricians, and internists. This cohort thus has some degree of overlap with the medical specialist cohort, which also includes pediatricians and internists, along with other varieties of more narrowly defined medical specialists.

1. Primary Care Physicians

In the regressions that were limited to primary care physicians only, the estimates produced by the equation at the mean were found to be reasonably close to the actual means, although a bit high in the regressions for the entire state with Philadelphia included. The R^2 is not as good in these regressions as was found generally for the regressions with all doctors. With center Philadelphia included, the variance explanation is in the range of 17 to 19 percent; and with center Philadelphia excluded, the variance explanation drops to a level of 14 to 16 percent.

The coefficients obtained from the regressions for primary care physicians are displayed in Table 3-20. These results indicate that, ceteris paribus, M.D. physicians in the primary care cohort have prices that are about 3.1 percent lower than those of primary osteopathic

TABLE 3-20. PRICE REGRESSION COEFFICIENTS: PENNSYLVANIA WITH AND WITHOUT CENTRAL PHILADELPHIA, BY INSURED MARKET, PRIMARY CARE PHYSICIANS

	Entire State			Central Philadelphia Excluded		
	Agg.	Blue Sh.	Med. B	Agg.	Blue Sh.	Med. B
DEGREE	-.0309	-.0815	-.0096*	-.0428	-.0826	-.0213*
	(.0103)	(.0119)	(.0104)	(.0120)	(.0140)	(.0120)
BOARD	.0851	.0715	.0952	.0786	.0648	.0888
	(.0084)	(.0097)	(.0085)	(.0094)	(.0110)	(.0094)
FMG	.0628	.0605	.0599	.0581	.0555	.0567
	(.0126)	(.0145)	(.0127)	(.0139)	(.0162)	(.0138)
ASSNMEN	-.0357	-.0462	-.0320	-.0427	-.0489	-.0387
	(.0094)	(.0109)	(.0095)	(.0109)	(.0127)	(.0109)
ASSOC	.0606	.0447	.0704	.0288*	.0190*	.0384
	(.0127)	(.0146)	(.0128)	(.0151)	(.0177)	(.0151)
AGE	-.2264	-.2456	-.2241	-.2135	-.2434	-.2032
	(.0165)	(.0190)	(.0166)	(.0181)	(.0211)	(.0180)
POPDENSE	.0189	.0156	.0212	.0074*	.0019*	.0087*
	(.0032)	(.0037)	(.0032)	(.0046)	(.0054)	(.0046)
PCINC	.0625	-.0193*	.0144*	.1135	.0970*	.1211
	(.0217)	(.0382)	(.0335)	(.0433)	(.0506)	(.0432)
PRIMEPOP	.0154*	.0896	.0507	.0389*	.0630	.0257*
	(.0332)	(.0250)	(.0219)	(.0224)	(.0261)	(.0223)
INSMONY	.0079*	.0063*	.0113*	.0024*	-.0019*	.0052*
	(.0116)	(.0134)	(.0117)	(.0117)	(.0137)	(.0117)
Constant	4.7374	5.0464	4.732	4.1136	4.3429	4.0229
R^2	.1915	.1702	.1934	.1580	.1434	.1519
F	73.53	63.68	74.42	47.12	42.04	45.00
Degrees of Freedom	10/3,104	10/3,104	10/3,104	10/2,512	10/2,512	10/2,512

Standard errors in parenthesis.

*Not significant at .05 level.

physicians in the aggregate market, and 8.2 percent lower in the market for Blue Shield services only. Board certification credentials in this cohort are associated with price levels that range from 6.5 to 9.5 percent higher than the prices of physicians without these credentials. The price reward for board certification is about two percentage points higher in the Medicare market than in the Blue Shield market; and the difference when center Philadelphia is included is about one percentage point higher. FMG prices are approximately six percent higher than those of other physicians. Primary care physicians who are members of the AMA or AOA have prices that are three to five percent lower than those of non-members. Primary care physicians who practice with at least one associate, as opposed to practicing solo, have prices that in the overall aggregate statewide market are 6.1 percent higher. This figure is about one percentage point lower when limited to the Blue Shield market segment only, and one percentage point higher when limited to the Medicare B segment. It can be seen that this is largely a Philadelphia phenomenon, however, since the percentage difference becomes much smaller or insignificant when center Philadelphia is taken out of the picture. As in the overall physician population, prices are negatively related to the physician's age, with a 10 percent increase in the physician's age bringing a decrease in the range of 2.0 to 2.5 percent in price of services.

Population density and per capita income both are related positively to the prices of primary care physicians' services, but the elasticities in most cases are very small and/or insignificant. The only relationships of any substance here are those represented by elasticities

of .11 and .12 for per capita income in the aggregate and Medicare B markets, respectively, outside central Philadelphia. Money inputs to the market from health insurance programs have generally positive relationship to prices, but the coefficients are small and not significant. The price response to supplies of physicians in their own broad specialty cohort similarly is uniformly positive, but generally small and often not significant.

2. Medical Specialists

The estimates produced by these equations tend to be a bit high for the state as a whole, and a bit low when central Philadelphia is excluded. The R^2 for the entire state is fairly good, indicating about 21 percent variance explanation with the combination of variables taken into account; but with Philadelphia excluded, the variance explanation is less.

The price regression coefficients for medical specialists are shown in Table 3-21. They show that, as in other cohorts, M.D. physicians have lower prices than D.O. physicians -- 6.1 percent lower in the aggregate market for the entire state, and 4.8 percent lower in the aggregate market for all of the state outside central Philadelphia. The price differential between M.D. and D.O. medical specialists is especially large in the Blue Shield market -- in the neighborhood of 11 to 13 percent. Board certification credentials again are seen to command higher prices, with board certified medical specialists having prices that are 6.6 percent higher in the aggregate market statewide. Also as before, board certification is seen to make a greater difference in the Medicare

TABLE 3-21. PRICE REGRESSION COEFFICIENTS: PENNSYLVANIA WITH AND WITHOUT CENTRAL PHILADELPHIA, BY INSURED MARKET, MEDICAL SPECIALIST PHYSICIANS

	Entire State			Central Philadelphia Excluded		
	Agg.	Blue Sh.	Med. B	Agg.	Blue Sh.	Med. B
DEGREE	-.0606	-.1271	-.0351*	-.0483*	-.1067	-.0198*
	(.0260)	(.0268)	(.0270)	(.0322)	(.0334)	(.0328)
BOARD	.0655	.0448	.0772	.0453	.0228*	.0608
	(.0104)	(.0107)	(.0108)	(.0123)	(.0128)	(.0126)
FMG	.0734	.0761	.0711	.0660	.0655	.0625
	(.0158)	(.0163)	(.0164)	(.0189)	(.0196)	(.0193)
ASSNMEM	-.0238*	-.0234*	-.0205*	-.0342	-.0255*	**
	(.0124)	(.0128)	(.0129)	(.0157)	(0.163)	
ASSOC	.0443	.0436	.0430	.0036*	.0075*	-.0306
	(.0133)	(.0137)	(.0138)	(.0177)	(.0183)	(.0160)
AGE	-.2621	-.2575	-.2873	-.2329	-.2511	-.2485
	(.0232)	(.0239)	(.0241)	(.0274)	(.0284)	(.0277)
POPDENSE	.0206	.0201	.0207	-.0089*	-.0106*	-.0042*
	(.0062)	(.0060)	(.0050)	(.0087)	(.0090)	(.0079)
PCINC	-.0146*	**	-.0225*	.2090	.2336	.1662
	(.0601)		(.0440)	(.0745)	(.0777)	(.0629)
MDSPPOP	-.0032*	.0166*	**	-.0031*	-.0169*	**
	(.0201)	(.0146)		(.0196)	(.0203)	
GPPOP	.1592	.1621	.1516	.0913	.0909	.0951
	(.0250)	(.0250)	(.0260)	(.0284)	(.0295)	(.0291)
INSMONY	.0191*	.0173	.0249*	-.0086*	-.0123*	**
	(.0222)	(.0197)	(.0214)	(.0223)	(.0231)	
Constant	4.8687	4.8136	5.0076	3.5321	3.5001	3.825
R^2	.2068	.1833	.2124	.1583	.1551	.1586
F	41.03	38.88	46.71	19.91	19.41	27.53
Degrees of Freedom	11/1,731	11/1,731	11/1,731	11/1,165	11/1,165	11/1,165

Standard errors in parenthesis.

* Not significant at .05 level.
**Not significant enough to be included in equation.

market than in the Blue Shield market, and in Philadelphia when compared to the rest of the state. Medical specialists who also are FMGs have prices that are a little more than seven percent higher than those of U.S. trained medical specialists. This coefficient becomes just a bit smaller when central Philadelphia is not included, indicating that the phenomenon of higher prices for FMGs is more pronounced in Philadelphia than elsewhere. Membership in the AMA or AOA is associated with marginally lower prices, but the coefficients for this variable are in general not significant. For the state as a whole, medical specialists who practice with associates have prices about four percent higher than their solo practice counterparts. Again, however, this may be reflecting an influence from central Philadelphia, since the coefficient becomes small or insignificant when Philadelphia is left out. The physician's age also is again related negatively to price. A ten percent increase in physician's age in this cohort is associated with a decrease of about two percent in price.

Population density is related positively to medical specialists' prices, but the coefficients are either insignificant or extremely small. Per capita income similarly has coefficients that are positive but not significant when looking at the state as a whole. When central city Philadelphia is excluded, however, the coefficient for per capita income becomes comparatively larger, indicating an increase of about two percent in physicians' prices in connection with a ten percent increase in per capita income. As before, the variable for input of health insurance monies is not significant. The coefficient for relationship of medical specialists' prices in relation to physician supplies within their own

cohort also is not significant. Medical specialists prices do, however, show a statistically significant positive price response to supplies of physicians in the general and family practice cohort, with the elasticity being about .16 for the state as a whole, and .09 for the state outside central Philadelphia. It may be supposed that general and family practitioners here are acting more as a complementary cohort than as a directly competing cohort.

3. Surgical Specialists

On the whole, the regressions for surgical specialists are not as satisfactory as those for other cohorts. The price estimation is fairly good for the overall state, but is substantially on the low side for the state without central Philadelphia. The R^2 for these regressions is smaller than in any other cohort, indicating only ten percent or less of variance explained.

The results displayed in Table 3-22 show that M.D. surgeons have prices 7.5 percent lower than their D.O. counterparts in the aggregate Blue Shield and Medicare B market. As in other cohorts, the difference is greater in the Blue Shield market than in the Medicare market, running as high as 10 or 11 percent for services covered by Blue Shield. Board certification has a positive relationship with prices of surgeons' services, but in the overall aggregate market statewide the price premium for board certification credentials is a comparatively modest 2.8 percent, and in the aggregate market outside central Philadelphia the coefficient on this variable is not significant. Segregating the Blue Shield and Medicare markets, it can be seen that board certification credentials for

TABLE 3-22. PRICE REGRESSION COEFFICIENTS:
PENNSYLVANIA WITH AND WITHOUT CENTRAL PHILADELPHIA
BY INSURED MARKET, SURGICAL SPECIALIST PHYSICIANS

	Entire State			Central Philadelphia Excluded		
	Agg.	Blue Sh.	Med. B	Agg.	Blue Sh.	Med. B
DEGREE	-.0769	-.1017	-.0795	-.0741	-.1136	-.0649
	(.0233)	(.0248)	(.0271)	(.0259)	(.0280)	(.0303)
BOARD	.0279	.0116*	.0468	.0153*	.0018*	.0355
	(.0115)	(.0122)	(.0133)	(.0122)	(.0132)	(.0143)
FMG	.0330	.0314*	.0163*	.0304*	.0335*	.0138*
	(.0159)	(.0170)	(.0186)	(.0172)	(.0186)	(.0201)
ASSNMEM	-.0354	-.0418	-.0434	-.0483	-.0539	-.0559
	(.0142)	(.0152)	(.0166)	(.0164)	(.0177)	(.0192)
ASSOC	.0102*	.0217*	-.0111*	-.0159*	.0031*	-.0253*
	(.0161)	(.0171)	(.0187)	(.0203)	(.0220)	(.0238)
AGE	-.1343	-.1417	-.1556	-.1525	-.1565	-.1653
	(.0258)	(.0275)	(.0300)	(.0281)	(.0304)	(.0329)
POPDENSE	.0201	.0127	.0262	.0024*	-.0057*	.0097*
	(.0048)	(.0051)	(.0056)	(.0068)	(.0073)	(.0097)
PCINC	-.0294*	.0058*	.0708*	.1535	.1958	.0973*
	(.0509)	(.0543)	(.0593)	(.0688)	(.0744)	(.0806)
PRIMEPER	.1113	.0652*	.1434	.0594*	.0082*	.0970
	(.0325)	(.0347)	(.0379)	(.0344)	(.0372)	(.0403)
INSMONY	.0236*	.0465	-.0077*	.0168	.0402	-.0147*
	(.0196)	(.0208)	(.0228)	(.0190)	(.0205)	(.0222)
Constant	4.6076	4.4180	5.0251	3.5867	3.4215	4.0475
R^2	.1092	.0815	.1000	.0787	.0684	.0696
F	23.35	16.90	21.15	12.66	10.88	11.07
Degrees of Freedom	10/1,905	10/1,905	10/1,905	10/1,481	10/1,481	10/1,481

Standard errors in parentheses.

* Not significant at .05 level.
**Not significant enough to be included in equation.

surgeons have no statistically significant relation to their Blue Shield prices in any context. As before, board certification is seen to count for more in the Medicare market than in the Blue Shield market. FMG surgeons are seen to have prices approximately three percent higher than the prices of surgeons who received their medical training in U.S. schools, an effect once again coming mainly from the Blue Shield segment. The coefficients for the FMG variable in general, however, are not statistically significant. Surgeons who are AMA or AOA members have prices four or five percent lower than the prices of non-members. There is no significant relationship accruing to the distinction between practicing solo or in association with others. As found generally in all other cohorts, surgeons' prices are found to be negatively related to their ages. The relationship is quantitatively smaller, however, than in other cohorts, with elasticities in the neighborhood of .13 to .16.

The coefficients for population density are very small and, when central Philadelphia is excluded, are also statistically insignificant. The coefficients for per capita income, on the other hand, fail to show statistical significance for the state as a whole, but show a positive elasticity of .15 in the aggregate when central Philadelphia is left out. The relationship of surgeons' prices to per capita income outside central Philadelphia is greater in the Blue Shield market, with an elasticity of .20 compared to an elasticity only half that large in the Medicare market. The impact of input of insurance monies is significant only in the Blue Shield market, where the coefficient is positive but very small.

There was considerable difficulty in finding a relationship of surgeons' prices with any physician supply variable. The regressions

simply would not work properly when they included a supply variable representing physicians in the surgeons' own cohort or representing supply of all direct patient care physicians. The most effective supply variable with respect to surgeons' prices was found to be the supply of primary care physicians relative to population. The relationship of surgical specialists' prices to this variable was found to be consistently positive; but in the Blue Shield market the coefficients also were found to be small and insignificant. In the Medicare market, an increase of ten percent in primary care physician supply generates a corresponding increase of 1.0 to 1.4 percent in surgeons' prices.

4. Comparisons Across and Between Specialty Cohorts

On the DEGREE variable, M.D. physicians are found to have lower prices in all cohorts, with D.O. physicians correspondingly having higher prices in all cohorts. The price difference between M.D. and D.O. physicians is smallest among primary care physicians, where M.D. prices are three to four percent lower, and is largest among surgical specialists, where M.D. surgeons are seven to eight percent lower. The price difference in favor of the D.O. is only slightly less among medical specialists than among surgeons. The price gap favoring osteopaths is substantially greater in the Blue Shield market than in the Medicare market for all specialty cohorts.

Board certification credentials command higher prices in all cohorts and in all markets. There are, however, differences between cohorts and between markets in the incremental return that these credentials bring. Board certification uniformly is seen to have a

greater price return in the Medicare market than in the Blue Shield market, and a greater return in center city Philadelphia than in the rest of the state. The difference between physicians who are board certified and those who are not is greatest in the cohort of primary care physicians. Presumably this is in part a reflection of the fact that it is the general practice physicians in this cohort who tend not to hold board credentials, and these are lower priced in any case. The price return for having board certification is smallest among surgical specialists, often being statistically not significant in this cohort. Board certification credentials are held, incidentally, by 50.8 percent of the medical specialists and 65.5 percent of the surgical specialists included in the data base for this study.

Prices are higher for FMGs in all cohorts, and in all markets, than they are for U.S. trained physicians. The price difference is uniformly about six percent among primary care physicians and seven percent among medical specialists. The difference among surgical specialists is only half as great and often is not statistically significant. The difference in prices between FMGs and other physicians would appear to be greater in Philadelphia than in the rest of the state, with the incremental price return for FMGs being about one percent higher when central Philadelphia is included than when it is left out. In general, the price difference favoring the FMG also tends to be greater in the Blue Shield market than in the Medicare market, but the difference in effect between these two market segments is so slight as to probably be of little real consequence.

The tendency for physicians who are members of their national professional association -- either AMA or AOA -- to be slightly less expensive occurs rather uniformly across all specialty cohorts, averaging about two to five percent overall difference in price. This difference is greatest among surgical specialists, where it is in the neighborhood of four or five percent. It is least among medical specialists, where it tends to be in the neighborhood of two or three percent and often is not significant.

The coefficient of the ASSOC variable is always positive, indicating higher prices for physicians who practice with associates than for physicians who practice solo. The effect is quantitatively quite different, however, in different specialty cohorts. The price difference between solo and not-solo physicians is greatest in the cohort of primary care physicians, where it is six percent in the aggregate market for the entire state. Among medical specialists, the difference is approximately four percent, and among surgical specialists it is uniformly small and not significant. Among those primary care and medical specialist physicians who do consistently exhibit higher prices for physicians practicing other than solo, the findings suggest that this is largely a Philadelphia phenomenon. The coefficients on this variable get comparatively much smaller, and in general are not statistically significant, when central Philadelphia is excluded.

The physician's age appears as the strongest price-related factor in all physician specialty cohorts and in all markets. It is uniformly negative in effect -- i.e., indicating that older physicians have lower prices, or conversely, that younger physicians are more expensive. The

age-related difference in price is greatest among physicians in the medical specialist cohort, and is smallest among surgical specialists. The elasticities of price with respect to physician age range from -.23 to -.29 for medical specialists, and range from -.13 to -.17 for surgeons. Primary care physicians' prices are only slightly less age-related than those of medical specialists, with elasticities in the range of -.20 to -.25. The age-based difference in price is generally comparable between Philadelphia and the rest of the state, and also is generally comparable between the Blue Shield and Medicare markets.

The coefficient for population density is uniformly positive in all regressions here, but also is uniformly small, indicating a weak effect for this factor in relation to price. In all specialty cohorts, the coefficient of population density is statistically not significant when Philadelphia is taken out of the base. Even with Philadelphia included, however, the coefficients tend to be very small -- in the neighborhood of .02 -- indicating only about .2 percent increase in price corresponding to a 10 percent increase in population density at the mean. For primary care physicians and for surgeons, population density has a greater effect in the Medicare B market than in the Blue Shield market. For surgeons, the coefficient is twice as large in Medicare B regressions as in Blue Shield regressions, but nevertheless is still small. On the whole, there is little difference between these broad specialty cohorts in their price response to population density.

Price responses to the per capita income factor are greatly mixed. This factor tends on the whole not to be significant for the primary care and medical specialist cohorts when center Philadelphia is

included. For surgical specialists, on the other hand, this factor shows as not significant when Philadelphia is not included. In those regressions where the per capita income variable is significant, it appears as a positive factor, but of relatively modest impact. For example, a 10 percent change in per capita income outside central Philadelphia generates a price change of approximately one percent for primary care physicians, or of approximately two percent for medical specialists. With Philadelphia included, a 10 percent difference in per capita income generates a change of 1.5 to 2.0 percent in prices for surgical specialists.

The coefficients obtained for the INSMONY variable in all of the regressions indicate that the effect of health insurance moneys (from Blue Shield, Medicare B, and state sources combined) is generally positive, but not significant. It may be relevant to note that, in trial regressions using a variable representing Medicare B monies only, the coefficients were very significant but the variable tended to have a destablizing effect on the regressions.

The coefficients appearing for physician supply variables are always positive (unless not significant), but indicate price relationships and effects that are generally modest at best, and that are diversely manifested in different specialty cohorts. The price variable for regressions on the primary care cohort related most rationally to the supply of physicians of their own kind. In general, the price response to own-cohort supply for this group of physicians is stronger in the Blue Shield market than in the Medicare market. The effect of this own-cohort supply factor also is stronger in relation to primary care physician

prices when Philadelphia is included in the analysis. Interestingly, the own-cohort supply factor for primary care physicians is significant in the aggregate market, but is not significant in the component Blue Shield and Medicare B market segments separately, at least not in most instances.

For the medical specialist cohort, the price regressions worked out best when simultaneously using supply variables representing supplies both in own-cohort and in the general and family practice cohort, both relative to population. The supply of physicians in their own cohort, nevertheless, still proved to be uniformly insignificant in relation to prices charged by medical specialists. On the other hand, medical specialists' prices are shown to increase at least slightly with increases in the supply of general and family practice physicians. The generalist cohort may act to some degree as competition for the medical specialist cohort, but they probably serve mainly as a complementary cohort providing referrals to medical specialists. The elasticities of medical specialists' prices with respect to generalist physician supplies are larger when Philadelphia is included.

For surgical specialists, no rational response of prices to supplies of physicians of their own kind could be found. The regressions for this cohort worked best, but still not entirely satisfactorily, in relation to supplies of physicians in the primary care cohort. It would seem clear that the primary care cohort is not acting here as competition for surgical specialists. The relationship is probably more one of complementarity, with primary care physicians serving as a source of referrals for surgical services. In general, the relationship of surgeons' prices to primary care supplies is greater in Philadelphia than

in the rest of the state on the average, and also is greater in the Medicare market than in the Blue Shield market. In the Blue Shield market, the coefficients of primary care supplies in relation to surgeons' prices were in fact insignificant.

In an attempt to obtain a better understanding of these problems, it was conjectured that the difficulties in obtaining good regressions for the surgical cohort might have sprung from the mixing of general surgeons with a variety of even more specially trained and more expensive types of surgeons. However, separate regressions splitting the general surgeons and "super-surgeons" apart into two different cohorts fared no better.

Upon further investigation of the data, it appears that surgical specialists are the one group in this study whose proportional representation in the sample has a distribution that differs markedly from the proportional distribution of supplies of these same kinds of specialists at the county level as derived from the physician registries used as the source of supply data for this study. In general, the supplies of surgical specialists implied by their proportional representation in the sample are larger than the proportional representation of surgical specialists for supplies listed at the county level in official physician registry sources. This effect could arise from the fact that the specialty status of any individual physician on record with Pennsylvania Blue Shield (which was the source of specialty status for this study) can be a self-designated specialty, and thus there very easily could be more physicians who designate themselves and who practice as surgeons than are on record as such in the official physician registries. If so, the regressions for the surgical cohort may be

suffering from the effects of an attempt to make explanatory sense out of a mismatch of prices for a self-designated cohort with the supplies of cohorts defined on a different kind of basis.

VII. SUMMARY AND DISCUSSION OF FINDINGS

Findings from the various stages of this study are found to be quite consistent and tend generally to reinforce one another. Certainly the general conclusions that can be reached concerning factor associations with the price variables and directions of effects observed are consonant throughout all parts of the study. The principal disparities between ANOVA results and regression analysis results here are that the price differences observed in connection with differences in various nominal physician characteristics tend to be larger in the analysis of variance than in the regression analysis. This is consistent, however, with what one would expect. The ANOVA captures and reflects the total associational effect that may be attributable to an explanatory variable either directly or indirectly, whereas the regression analysis trims away the indirect effects and yields a result that may be taken as much closer to the "pure" quantitative effect associated with an explanatory variable when all other explanatory variables remain fixed and their effects are factored out.

A. GENERAL RECAP AND OVERVIEW OF FINDINGS

The analysis of variance found that 18 percent of the variance in individual physicians' prices is accounted for by the physician's specialty. Even at the level of broad specialty class cohorts -- defined as generalist physicians, medical specialists, surgical specialists, or other specialists -- broad specialty class accounts for 11 percent of the variance in physicians' prices. Specialty status generally is regarded as

an indicator of higher quality in the services provided; and if it may be presumed that consumers of physicians' services seek quality, this then could become a demand-related factor, which ordinarily would be expected to be translatable to higher prices for the provider with such credentials. In this regard, the ANOVA stage of the study pointed out that specialists of all kinds have relative price levels that, on the average, are 22.3 percent higher than generalist physician prices. This is generally consistent with the price premium for specialty status found in the Medicare market segment; but in the Blue Shield market segment, specialty status brings a somewhat smaller reward, with the relative price levels for specialists of all kinds being only 16 percent higher than generalists' prices. These figures, while accurate at face value, may be somewhat overstated as the "pure" price increment attributable to specialty and to specialty alone. (Note the observations about ANOVA methodology at the beginning of this chapter.) The regression analysis adds findings to indicate that medical specialists command prices 11.5 percent higher than the average for all other physicians (including other kinds of specialists) in the aggregate market for physicians' services, 11.9 percent higher in the Blue Shield market, and 12.8 percent higher in the Medicare market. For surgical specialists, the price premium for specialty credentials is 9.9 percent in the aggregate market, 9.1 percent in the Blue Shield market, and 11.7 percent in the Medicare market.

Another indicator of quality is board certification and, assuming that the consumer has knowledge of this status and awareness of its meaning, board certification also should act as a demand-related factor and should be translatable into higher prices for the physician with such

credentials. The breakdown analysis conducted in conjunction with the analysis of variance confirms this, indicating that physicians with board certification standing have prices that are 14.5 percent higher than the prices of those who are not boarded. The regression analysis also showed this to be a positive factor in relation to physicians' prices, but indicated the price differential for board certification credentials as a relatively much more modest 6.0 percent. The apparent discrepency here can be explained by assuming that the regression analysis captured the essentially "pure" effect, while the ANOVA captured a number of indirect effects as well. In that sense, both results would be correct. From the regression analysis findings, it also is found that the price premium for board certification credentials differs for different broad specialty class cohorts. The price return for board certification credentialing is highest for primary care physicians, for whom the increment is 8.5 percent. It is lowest for surgical specialists, who show a price increment of 2.8 percent in the aggregate market for board certification. Medical specialists show a relatively higher reward for board certification credentials, at 6.6 in the aggregate Blue Shield and Medicare B market.

Other factors commonly construed as being related to the quality of medical care have to do with the physician's medical education. In particular, foreign medical graduates (FMGs) are generally regarded as having a medical education inferior to that of U.S. medical school graduates; and osteopathic (D.O.) physicians, whether justified or not, are often regarded as having training inferior to that of M.D. physicians. If, indeed, the FMG and the D.O. have inferior training, then this should

act as a negative quality indicator and also should act as a negative demand factor in the eyes of most informed consumers. FMG and D.O. prices accordingly should be lower than those of other physicians, all other things being equal. Such is not the case. The ANOVA found the gross price difference between FMG and U.S. medical graduate physicians to be 8.1 percent, with the FMG having the higher prices. The comparatively more pure effect isolated by the regression analysis still showed the FMG's price levels to be 5.5 percent higher, ceteris paribus. In both the ANOVA and regression analysis results, higher prices for FMG physicians are found to hold through all broad specialty-oriented cohorts. In general, the difference in price between FMGs and other physicians is a bit more pronounced in the Medicare market than in the Blue Shield market. The anticipated negative price impact for the lesser quality of care sometimes presumed to be provided by osteopathic physicians also is contradicted by the empirical findings. From the regression results, D.O. physicians are found to have prices that are 11.1 percent higher in the Blue Shield market, 3.9 percent higher in the Medicare market, and about 6.0 percent higher in the aggregate market statewide.

The physicians' age also is sometimes taken as a quality-related factor, on the premise that the mid-career physician should be expected to be delivering the highest quality services. Under this assumption, younger physicians are regarded as lacking the experience to deliver the best quality services, and older physicians are regarded as having obsolescing skill and/or knowledge levels. The findings, however, both from ANOVA and from regression analysis, are that the relationship of the physician's age to prices of services is strictly monotonic and negative.

Thus, the oldest physicians tend to have the lowest prices, and the youngest tend to have the highest prices, with an orderly and steady progression in between. ANOVA results showed the youngest ten percent of physicians to have prices 26 percent higher than those of the oldest ten percent of physicians in the aggregate market, 32 percent higher in the Blue Shield market, and 26 percent higher in the Medicare market. A similar relationship prevails through all specialty cohorts. To this, results from regression analysis added that the physician's relative price level decreases approximately two percent for every ten percent increase in the physician's age at (or very near) the mean. It should be added, incidentally, that it is in fact far from clear that the physician's age should be taken as a negative demand-related facet of the quality of services delivered. In many cases, the older physician may have cultivated patient-physician relationships that more than compensate for any possible obsolescence of skills in the perception of the medical services consumer.

Considering some of the physician's affiliations, the physician who is a member of his national professional association (AMA or AOA) tends to be a lower priced physician. The regression analysis indicated this differential to be 3.6 percent in the aggregate market for all physicians statewide. The phenomenon of lower prices for national association members has a somewhat greater impact in the Blue Shield market, where the differential goes up to 4.3 percent for all physicians statewide. There are slight differences in this effect by broad specialty cohorts, with primary care and surgical specialist physicians tending to be at or near the level of price difference noted for all physicians, but with medical

specialists showing prices for national association members that are only 2.4 percent lower and statistically not significant.

For some other affiliations, the physician who participates with Blue Shield is found to have relative price levels that are on the order of 6.4 percent lower overall, compared to nonparticipating physicians. Under Medicare, the physician who consistently takes assignment has prices some 14 percent higher than the physician who consistently declines assignment. It is most interesting to note that the relation of the physician's price to his decision to participate in an insured program takes precisely different directions in Blue Shield as compared to Medicare Part B. The physician who participates with Blue Shield has lower prices, while the physician who "participates" with Medicare B has higher prices. This possibly may be a behavioral response having to do with the all-or-nothing participation decision under Blue Shield, as compared to the case-by-case assignment acceptance option under Medicare.

The physician who practices in collaboration with associates is found to have higher prices than the solo physician in all cases. The regression analysis indicated that the physician who has at least one associate will have price levels approximately three percent higher than solo physicians. ANOVA, although probably overestimating somewhat (for reasons discussed earlier), showed that those who practice in groups of 15 or more have prices 22 to 24 percent higher than those in solo practice. The tendency for physicians with more associates to have higher prices is found in every specialty cohort.

Other practice characteristics taken into consideration in this study were found by the ANOVA to be generally weak in relation to explanation of

the variability in relative price levels between different individual physicians. (Practice characteristics other than those already discussed were not taken into consideration in the regression analyses.) Overall, measures of practice size or physician output showed little relationship to physicians' price levels. Measured in terms of raw annual numbers of services delivered, or in terms of total annual dollar volume of billings (deflated by both the local CPI and the individual physician's relative price index, in which case the resulting deflated annual dollar volume might serve as a reasonably good measure of the physician's real output for the year), there was no significant relationship between physicians' activity levels and their prices. A positive, but very slight, relationship was found between the physician's relative price level and the size of his active patient roster for the year. The intrinsic value of services delivered by a physician also was found to have no meaningful or sizeable relationship to the prices he charges for services performed in common with other physicians having practices with different typical intrinsic valuations for services delivered. (In simpler terms, there is no significant difference between doctors who typically perform "big ticket" services and doctors who typically perform "nickel and dime" services in terms of prices they respectively charge on the average for whatever services they may both perform.) The one practice factor showing a bit of relationship to physicians' prices was the intensity of services delivered per patient. In general, the tendency is for physicians delivering fewer services per patient to charge higher prices, or conversely, for those delivering more services per patient to charge lower prices. This service intensity factor was related to price only

relatively weakly, however. Whatever the magnitude or significance of the effects they may have, factors generally describing the size, volume, or activity level of the practice exhibit as positively related factors, and the intensity of services appears as a negatively related factor.

Slight as they are, the relationships of physicians' practice characteristics to their relative price levels tend to vary somewhat for different specialty cohorts. For medical specialists, higher prices tend to be associated with larger active patient rosters and greater proportions of Medicare patients. Surgical specialists, by contrast, appear to have price levels that are inversely related to service intensities and price-adjusted annual billings (output). Insofar as surgeons are concerned, it may be suggested that surgeons have relatively more discretion than most other types of physicians to trade off prices against output of services so as to achieve whatever balance best suits their personal utilities. General and family practice physicians, finally, do not appear to exhibit any noticeable relationship of their prices to their practice characteristics. For generalist physicians, this may suggest at least some aspects of a competitive market situation in which they have to accept the prices set by the market, regardless of differences in their individual practices.

One final factor that may be attached to the individual physician, although it is more an imposed factor than one on which he makes his own decision, is the proportion of his Blue Shield claim line items reimbursed under usual, customary, and reasonable (UCR) methods of reimbursement. This is of interest because UCR reimbursement methods have increasingly come to be regarded as instruments of price inflation in the physicians'

services market. The argument generally put forth by critics is essentially that, once the physician comes to understand how UCR really works, it can become for all practical purposes a "blank check," offering ample opportunities for financial exploitation if the physician so chooses. The UCR reimbursement method also is quite generally regarded as inflationary from the perspective that it actually may encourage physicians to raise their prices in order to stay ahead of the time lags in the UCR system's response to an inflationary economy. Conceptually and intuitively, these arguments for the inflationary impacts attributable to UCR reimbursement seem compelling. Even if these things are in fact happening in Pennsylvania, however, the empirically observed facts in this study fail to support that conclusion. Perversely (perhaps), physicians' prices in Pennsylvania are found to be related negatively to the proportional volumes of their Blue Shield claims reimbursed under UCR. That is, physicians who have greater proportions of UCR claims tend to have lower prices, and vice versa. This is true for all broad specialty cohorts, as well as for the overall physician population. In the Blue Shield services market, the lowest priced physician quintile averages 71.0 percent of their Blue Shield line items under UCR; and the highest priced quintile averages only 59.6 percent UCR line items. The relationship progresses steadily downward in terms of percent of line items reimbursed under UCR for increasingly high priced physician quintiles.

A substantial part of the variation in Pennsylvania physicians' prices is manifested in terms of geographic areas. Not surprisingly, the highest prices in the state tend to be found in Philadelphia, the state's largest major metropolitan area; and the lowest prices tend generally to

be found in rural areas. Curiously, the prices of physicians' services in the Pittsburgh area, while somewhat high, are not as high as might be expected for a major metropolitan area. Perhaps this is because Pittsburgh, both physically and sociologically, appears to function more as a loosely connected network of disjointed neighborhoods and outlying suburbs than as a single homogeneous urban mass -- i.e., there are ways in which much of greater Pittsburgh retains the character of smaller communities. Beyond the expected differences between places like Philadelphia, Pittsburgh, and rural Pennsylvania, there is additional diversity in the state's several lesser metropolitan areas. Some of them appear to have higher prices than those found in Pittsburgh; and a few others, at least in some insured markets, appear to have generally lower physicians' price levels than are found in purely rural areas. Overall, ANOVA indicated that 14.5 percent of the variance in Pennsylvania physicians' prices is attributable to geographic area of practice, at the county level.

While it is clear that there is price diversity from area to area, it is less clear what accounts for these area-based price differences. Both in analysis of variance and in regression analysis, the socioeconomic and demographic characteristics of various areas failed to account very strongly for the price differences between areas. Nevertheless, some generalizable patterns do emerge. From the ANOVA, the locality characteristics most strongly associated with physicians' price levels appeared to be the input of Medicare money to the local physicians' services economy, the local projection of the CPI, the population density, and the supplies of medical specialists and primary care physicians

relative to population size. In general, urbanization -- encompassing a number of typical features of urbanism in addition to mere density of population -- appears to be an important influence. All of the above are found to be related positively to physicians' prices -- i.e., physicians' prices increase in association with quantitative increases in each of these factors. Per capita income, while also related positively, did not appear in ANOVA as a very strong factor. Nor did the proportions of elderly people in the population or the general educational attainment levels of the population. The proportion of laborers found in the composition of the workforce exhibited a modest relationship to physicians' prices, which has been interpreted here as possibly having a cultural component as well as an income-related component. Among some typical operating cost factors, local rents were found to have a slight relationship to price levels, but the variable used to represent physicians' office staff costs showed no noticable relationship to their relative price levels.

These general relationships -- or lack of relationships -- between physicians' prices and locality characteristics tend to prevail within more narrowly defined cohorts of physicians by broad specialty class. However, as might be anticipated, different specialty-oriented cohorts tend to show different kinds of patterns in the observed associations between their prices and the associated practice locality variables. General and family practitioners, for instance, appear to have their prices influenced by a relatively greater number of these practice locality considerations; and, more than any other cohort, they seem to be somewhat subject to conventional economic forces and cost factors.

Medical specialists, by comparison, show generally less strong relationships between their prices and the characteristics of their practice locales. Further, medical specialists' prices appear to be less influenced by, or associated with, conventional price-related economic forces. Surgical specialists provide still another kind of contrast, having only a comparatively small number of locality factors associated with their relative price levels, but also showing the relationships that do exist to be stronger than any other cohort. Both classes of specialists appear to have their prices influenced most particularly by urbanization and by inputs of Medicare program monies.

To provide some additional depth and understanding, it was demonstrated that Philadelphia County, constituting the inner city part of the greater Philadelphia urbanized area, differs greatly from the rest of Pennsylvania in almost every way. It further was demonstrated that the inclusion of Philadelphia County in the analyses introduces a substantial urban bias in the results obtained. Without detailing all of the differences observed when center city Philadelphia is omitted, it may be noted for present purposes that, in general, factors related to urbanization become less important, and that some of the conventional economic forces become a bit more effectual.

Quantitative econometric findings from the regression analysis are consistent with, and generally confirm, the specific findings and market tendencies suggested by the ANOVA. To reduce the problems arising from multicollinearities between independent variables, however, the regression analysis included only a relatively small number of locality-related factors -- specifically, the included variables were population density,

per capita income, composite dollar inputs from health insurance programs (Blue Shield, Medicare B, and state sources), and county-level supplies of physicians in various cohorts. In general, the effects of demand-related locality variables in the econometric analysis were found to be positive, but small.

Regarding physician supplies, the analysis of variance and accompanying correlation data showed a clear positive relationship of physician supply to physicians' prices, both overall and by broad specialty-oriented cohorts. Primary care physicians and medical specialists showed a rather strong relationship between their relative price levels and supplies of physicians within their own cohorts. Generalist physicians and surgical specialists, on the other hand, showed no significant relationships of their prices to supplies of physicians of their own kind. Significant cross-specialty relationships also were found. In these crossover relationships between supplies and prices in various cohorts, generalist physicians were found to be the most affected by supplies of other kinds of physicians, while medical specialists were the least affected. On the other side of this, generalist physician supplies were found to have the least relationship to prices of physicians in other cohorts, while medical specialist supplies had the greatest relationship to prices of physicians of other kinds. Surgeons' prices appeared to respond to supplies of complementary types, including both medical specialists and primary care physicians. Presumably these act as sources of referrals for surgical services. The general patterns of supply-to-price relationships revealed in the ANOVA seemed to reflect a comparatively strong and influential position for medical specialists in

the overall market for physicians' services. This particular observation, however, was not supported by the regression findings. Medical specialist supplies, when taken into account in the multivariate regression, had no significant impact. Other than that, the regression analysis generally supports the ANOVA, simply providing further and more finely refined quantification of effects of physician supplies upon prices. Overall, in the aggregate market statewide, the prices of all direct patient care physicians were found to have an elasticity of about .10 in response to supplies of general and family practice physicians, and a substantially smaller elasticity with respect to proportional medical specialist supplies. On preliminary trials, the prices for all direct patient care physicians (as a composite population) failed to respond in any orderly way to the overall physician supply or to supplies of surgeons.

B. CONCLUSIONS ON THE NATURE OF THE MARKET

This study was not structured -- nor was it meant to be structured -- to provide any ultimately definitive resolution of the theoretical questions concerning the nature of the market for physicians' services as an economic system. Nevertheless, the findings obtained here do skirt all around the edges of several fundamental issues regarding the nature of this market; and the findings clearly invite comment on what they may seem to imply in relation to these fundamental market questions.

In the first place, the findings here point fairly clearly to an overall judgment that conventional economic demand factors are of only limited consequence in the determination of physicians' prices in

Pennsylvania. When looking at the entire state, with Philadelphia included, demand factors are found to be small or insignificant. If Philadelphia County is excluded, so that the object of study becomes the physicians' services market everywhere in Pennsylvania other than center city Philadelphia, demand factors assume a position in relation to prices that is at least slightly more rational. The elasticity of prices with respect to per capita income, for example, becomes significant and appreciably larger. Still, the picture remains very greatly mixed, as other companion indicators of demand do not always go along with per capita income in these results. To the extent that demand factors do achieve any significance, or become at least large enough to be noticed, they present themselves as positively related to price.

The relationship of physician supplies to prices in the market for physician services is, as noted several times throughout this report, consistently positive. This relationship presents itself in a complicated variety of ways, however, depending upon the particular specialty cohort involved, depending upon whether the geographic domain does or does not include Philadelphia, and often depending upon the specific market being examined (Blue Shield, Medicare, or aggregate). There are certain combinations of market, physician cohort, and geographic domain for which the physician supply variable is either insignificant or negligibly small. When dealing with all physicians, the relation of physician supplies to price was positive in every case tested, but clearly was stronger with Philadelphia included. For primary care physicians, a clearly positive relationship of supplies to prices is found in the Medicare market only if Philadelphia is included; but it is found in the Blue Shield market in

both cases tested. Medical and surgical specialists' prices appear to be positively related to supplies of complementary types of physicians, with neither showing any within-cohort relationship of physician supplies and prices. In terms of geographic domain, this effect -- where it appears at all -- is generally stronger when Philadelphia is included. Comparative patterns of supply-price relationship also differ between the Blue Shield, Medicare, and aggregate markets, but do so in a manner that does not admit any easy generalizations.

One conclusion emerging from all this is that the market is clearly segmented, with the segments being defined at least along geographic lines, along specialty-oriented lines, and by differences between insurance programs, as suggested above. It also seems clear that there are substantial and important differences between some of these segments in terms of their fundamental market character and market behavior, which of course would include differences in the way prices are determined.

Acknowledging the limitations of the available information here, let us for present purposes consider only the overall market for all physicians' services. Even with this relatively limited information, there is enough to once again confirm that the market for physicians' services is not a classically competitive market. The principal evidence for this lies in the observed positive relationships of physician supplies with prices and, perhaps even more so, in the diversity of prices observed. While ruling out a purely competitive market, it might also simply be observed that no one today really believes the market is purely monopolistic either. On the basis of the facts available to and from this study, one could hazard a reasonable guess that the market is

monopolistically competitive. While the findings here are not sufficient to prove the monopolistically competitive model, they are at least consistent with that model insofar as they go. The available facts and findings here also are consistent with supplier-induced demand models. Excess demand models, incidentally, can be ruled out on the basis of the negative relationships between prices and intensity of services observed in the descriptive data accompanying the ANOVA. Overall, then, the evidence from this study would seem to suggest physician-induced demand, at least in some major segments of the market, within the general framework of a monopolistically competitive market.

Whatever the true economic nature of the market, these study findings also leave a few subjective impressions concerning this market and the overall behavior of physicians in the market. Although some good substantive findings of price relationships and price-related effects have been turned up in these analyses, and some interesting and useful insights correspondingly may have been gained, the relatively low explanatory power of the factors examined here deserves some attention. A considerable portion of the observed variation in physicians' prices clearly remains unexplained. It has been noted that specialty and geographic area of practice account for an understandably large part of the price variation that occurs. Beyond that, however, it still is less than perfectly clear why some specialties and some geographic areas exhibit different prices in the way that they do. Factors characterizing practices and practice locations at a more detailed level explain relatively little and, when they do explain, tend to explain only weakly. The general pattern of findings and failed findings suggests that the market, viewed in purely

economic terms, must be acknowledged as imperfect. It also must be suspected that the market behavior of physicians, including their price determination processes, may be only partially driven by economic forces and considerations. If so, there may never be any great success in attempts to model and understand these phenomena in purely economic terms.

Two other possible courses of explanation come to mind. First, in relation to the low level of significance attached to many practice characteristics, it may be that the individual physician's personal utilities play a very significant role. This role may sometimes be sufficiently dominant to override conventional rational economic considerations in the determination of the physician's market behavior. Secondly, the marked geographic variation observed in physician's prices, together with the rather low explanatory power of locality characteristics, also suggests that something other than purely economic forces may be operating. One easy conjecture here would be that the behavior of physicians in their local markets may be determined to some substantial degree by social and political influences tied to the infrastructure of the profession in local market areas. This is not meant to imply conscious collusion among physicians in their market behavior. Rather, this would have to do with the market impact of a whole system of tacit understandings and shared values within definable local professional communities.

C. POLICY IMPLICATIONS

With regard to national health policy issues, the focus here has been on the price and cost related aspects of the health care system -- in particular, on the determination of prices in the physicians' services component of that system. It is apparent that the system is somehow out of balance and that it needs to be better rationalized. In particular, it is apparent that prices and costs need to be brought under better control.

To achieve this, it should be evident from relatively recent experience that an arbitrary price freeze is not the answer. A freeze simply puts the market even more out of balance and builds up pressures that eventually may be even more dangerous. Regulation, while unfortunately sometimes a necessary element, is not the complete answer either. Regulation is inherently both stifling and itself expensive, and should be a solution of last resort. Nor does the answer lie in the institution of a sweeping national health service, along the lines of the British model. The nation simply cannot afford this, and it has to be out of the question. Moreover, the government does not have a particularly accomplished record of managing such grandiose bureaucratic enterprises effectively and efficiently. A comprehensive national health insurance program of the types associated with Senator Kennedy's efforts, and broadly supported by organized labor over the years, probably would be equally futile if costs and market processes are not first brought under better control.

What is most needed is genuine market reform. This has to be done very carefully, however. It is clear that certain past moves designed to promote competition have failed, or worse, have yielded perverse results. Increasing the supply of physicians, for instance, has only served to increase prices in many instances, as physicians apparently quite often respond to increased competitive supply in ways typified by the demand-inducement and target income hypotheses. It also must be observed that any approach designed to make the market more purely competitive through fundamental structural changes probably could be achieved only through large-scale government intervention and control that may in the end prove self-defeating. The status quo is very stoutly institutionalized and resistant to radical change.

The most constructive policy options most likely would be those that work toward restructuring certain details of the market process within the basic context of the currently existing system. The emphasis in recent times has tended to be directed primarily toward better management and control of the supply side -- i.e., measures aimed most essentially at the provider. In attempting to achieve better management and control of the situation, perhaps it would be wise to shift more of the emphasis to the demand side. In particular, steps should be taken that will encourage more prudent consumer choices in the acquisition of health care. Medical care is not a free good, and we would do well to stop making it look like a free good so often and so easily. This means, for one thing, that the consumer must be given a significant and meaningful cost sharing responsibility. Along this vein, of course, it also must be acknowledged that there are reasonable limits beyond which increased cost sharing could

deter needed care, and moreover would not be politic. Also, in this same vein, it would help if the cost of health insurance -- both public and private -- were made less invisible.

The following specific other steps may be suggested as conformable with these suggestions and as offering some additional possibility of constructive outcome:

(1) We should continue to provide for only the truly needy with public money. Those who are financially capable should be directed to the private insurance market, with less subsidization in the form of such things as tax deductions for health insurance payments. The discontinuation of any already existing subsidies will of course not be very popular. Nevertheless, this would be one specific move that would make the true cost of health care more visible and would help to promote more prudent consumer behavior. (In the interest of social and economic justice, this general framework might also include some kind of publicly funded or publicly subsidized catastrophic medical insurance for those who do not have access to private major medical programs.)

(2) Observing that greater input of Medicare Part B monies to local physicians' services markets tends to be associated with higher prices in those markets, we should be very careful about our public generosity and future extensions of Medicare benefits.

(3) It also may be desirable to make Medicare assignment an all-or-nothing proposition, similar to Blue Shield participation. The findings here show that Blue Shield participation is associated with lower prices, but consistent Medicare assignment acceptance is associated with higher prices. The difference may indeed be in the case-by-case option under Medicare. The next challenge then would be to determine how to encourage physicians to opt "in" rather than "out" of the program.

(4) A further step that might be helpful in encouraging physicians to opt "in" to participation in publicly funded health insurance programs would be to bring to all of the needy under the umbrella of a single program. The needy, in all categories, can present a very significantly sized market in most communities -- a market that might be hard for a physician to ignore. If the needy were presented as a single market, it would be less tractable for the physician to segment his market and participate for some of the needy without participating for all of the needy; and, as already noted, <u>all</u> of the needy might constitute a market to which it would be hard to say "no."

(5) Finally, more effective inducements are needed -- or regulation, if it comes to that -- to improve the distribution of professional medical manpower. There are already too many physicians in certain specialties and in certain geographic

localities (while still too few in others). The findings here and in other studies show very clearly that, in most specialty-oriented cohorts, increased physician supplies (if we permit that to happen) result in higher, not lower, prices.

REFERENCES

Altman, Stuart H., and Joseph Eichenholz, "Inflation in the Health Industry -- Causes and Cures." In Health: A Victim or Cause of Inflation (Michael Zubkoff, ed.). New York: PRODIST (published for Milbank Memorial Fund), 1976, pp. 7-30.

Auster, Richard, and R. Oaxaca, "Identification of Supplier Induced Demand in the Health Care Sector," The Journal of Human Resources, Vol. XVI, No. 3, Summer 1981, pp. 327-342.

Bureau of Health Manpower, The Target Income Hypothesis (Jesse Hixson, ed.). U. S. Department of Health, Education, and Welfare; Health Resurces Administration, Publication No. (HRA) 80-27, 1980.

Burney, Ira L., George J. Schieber, Martha O. Blaxall, and Jon R. Gabel, "Geographic Variation in Physicians' Fees," Journal of the American Medical Association, Vol. 240, No. 13, September 22, 1978, pp. 1368-1371.

Business Week, "Rx: Competition," No. 2726, February 8, 1982, pp. 58- 64.

Cromwell, Jerry, The Role of Competition in Physician Pricing and Output: A Longitudinal Study in Pennsylvania. Camp Hill, PA: Pennsylvania Blue Shield, Research Report R-419-15, November 1981.

Dyckman, Zachary Y., A Study of Physicians' Fees. Staff Report prepared by the Council on Wage and Price Stability, Executive Office of the President. Washington, D.C.: U.S. Government Printing Office, March 1978.

Eisenberg, Barry S., "Medical Practice Expenses: Trends, Determinants and Impact." In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Hospital Association, 1978, pp. 37-60.

Evans, Robert G., "Supplier-Induced Demand: Some Empirical Evidence and Implications." In The Economics of Health and Medical Care (Mark Perlman, ed.). New York: Halsted Press, 1974.

Feldstein, Martin S., "The Rising Price of Physicians' Services," The Review of Economics and Statistics, Vol. LII, No. 2, May 1970, pp. 121-133.

Fox, Daniel M., "From Reform to Relativism: A History of Economists and Health Care," Milbank Memorial Fund Quarterly/Health and Society, Vol. 57, No. 3, Summer 1979, pp. 297-336.

Freeland, Mark, and Carol Ellen Schendler, "National Health Expenditures: Short-Term Outlook and Long-Term Projections," Health Care Financing Review, Vol. 2, No. 3, Winter 1981, pp. 97-138.

Fuchs, Victor R., and Marcia J. Kramer, Determinants of Expenditures for Physicians' Services in the United States 1948-68. National Center for Health Services Research and Development; DHEW Publication No. (HSM) 73-3013, December 1972.

Fuchs, Victor R., "The Supply of Surgeons and the Demand for Operations," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 35-56.

Gibson, Robert M., and Daniel R. Waldo, "National Health Expenditures, 1980," Health Care Financing Review, Vol. 3, No. 1, September 1981, pp. 1-54.

Goldfarb, Marsha G., Mark C. Hornbrook, Joyce V. Kelly, and Alan C. Monheit, "Health Care Expenditures." In Health United States 1980, U. S. Department of Health and Human Services, Office of Health Research, Statistics, and Technology. DHHS Publication No. (PHS) 81-1232, December 1980, pp. 101-116.

Green, Jerry, "Physician-Induced Demand for Medical Care," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 21-34.

Hadley, Jack, John Holahan, and William Scanlon, "Can Fee-for-Service Reimbursement Coexist With Demand Creation?" Inquiry, Vol. XVI, No. 3, Fall 1979, pp. 247-258.

Hadley, Jack, and Robert Lee, Physician Price and Output Decisions: Theory and Evidence, Urban Institute, Working Paper 988-8, Washington, D. C. , April 1978.

Held, Philip, and L. Manheim, "The Effect of Local Physician Supply on the Treatment of Hypertension in Quebec." In The Target Income Hypothesis, (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 44-59.

Holahan, John, and William Scanlon, Physician Pricing in California: Price Controls, Physicians' Fees, and Physicians' Incomes from Medicare and Medicaid. U.S. DHEW, under contract with the Urban Institute; DHEW Publication No. (HCFA) 03006, September 1979.

Jensen, Lynn E., "Trends in Health Care Costs and Prices". In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Medical Association, 1978, pp. 1-26.

Juba, David A., Price Setting in the Market for Physicians' Services: A Review of the Literature. Camp Hill, Pennsylvania: Pennsylvania Blue Shield, Research Report R-79-1, January 1978. (Also released as DHEW Publication No. (HCFA) 03012, September 1979.)

Lee, Robert H., and Jack Hadley, "Physicians' Fees and Public Medical Care Programs," Health Services Research, Vol. 16, No. 2, Summer 1981, pp. 185-203.

Markel, Gene A., and Laverne J. Dudley, Patterns of Pricing Behavior in the Pennsylvania Physician Services Market. Camp Hill, Pennsylvania: Pennsylvania Blue Shield, Research Report R-419-14, November 1981.

May, J. Joel, "Factors Influencing the 'Demand' for Health Care." In National Commission on the Cost of Medical Care, 1976-1977; Vol. 2, Collected Papers. Monroe, Wisconsin: American Medical Association, 1978, pp. 117-122.

McLean, Robert A., "The Structure of the Market for Physicians' Services," Health Systems Research, Vol. 15, No. 3, Fall 1980.

Mitchell, Janet B., and Jerry Cromwell, Physician Induced Demand for Surgical Operations. Final Report submitted under HCFA Grant 95-P-97245/2-01, December 1980.

Mitchell, Janet B., Jerry Cromwell, and Rachel Schurman, Physician Participation in Public Programs. Chestnut Hill, Mass.: Center for Health Economics Research, September 1981.

Newhouse, Joseph P., "A Model of Physician Pricing," Southern Economic Journal, Vol. XXXVII, No. 2, October 1970, pp. 174-183.

Newhouse, Joseph P., "The Structure of Health Insurance and the Erosion of Competition in the Medical Marketplace." In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 215-229.

Newhouse, Joseph P., and Charles E. Phelps, "Price and Income Elasticities for Medical Care Services." In The Economics of Health and Medical Care (Mark Perlman, ed.). New York: Halsted Press, 1974.

Paringer, Lynn, "The Medicare Assignment Rates of Physicians: Their Responses to Changes in Reimbursement Policy," Health Care Financing Review, Vol. 1, No. 3, Winter 1980, pp. 75-89.

Pauly, Mark V., "Is Medical Care Different?" In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 11-35.

Pauly, Mark V., Doctors and Their Workshops: Economic Models of Physician Behavior. Chicago: University of Chicago Press, 1980.

Pauly, Mark V., "Hospital Characteristics, Physician Productivity, and Fee Levels." In Issues in Physician Reimbursement (Nancy Thorndike Greenspan, ed.); Health Care Financing Conference Proceedings. HCFA Publication No. 03121, August 1981, pp. 31-74.

Pauly, Mark V., and Mark A. Satterthwaite, "The Effect of Provider Supply on Price." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/HMA, Publication No. (HRA) 80-27, 1980, pp. 26-36.

Pennsylvania Blue Shield, PBS Charge/Allowance Indexes for 3rd Quarter, 1981. Research Division, Quarterly Index Report #28, November 1981 (Proprietary).

Ramsey, James B., "An Analysis of Competing Hypotheses of the Demand for and Supply of Physician Services." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 3-20.

Redisch, Michael, Jon Gabel, and Martha Blaxall, Physician Pricing, Costs and Incomes. Paper prepared for Western Economic Association meetings, Anaheim, California; June 20, 1977.

Reinhardt, Uwe E., "A Production Function for Physicians Services," The Review of Economics and Statistics, Vol. 54, February 1972, pp. 55-56.

Reinhardt, Uwe E., "Comment" (on Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 121-148.

Roehrig, Charles S., "A Formal Model of Target Income Pricing with Supplier-Induced Demand." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW//HRA/DMA, Publication No. (HRA) 80-27. 1980, pp. 21-25.

Rushefsky, Mark E., "A Critique of Market Reform in Health Care: The 'Consumer-Choice Health Plan'," Journal of Health Politics, Policy and Law, Vol. 5, No. 4, Winter 1981, pp. 720-741.

Sloan, Frank, "Physicians Fees and Length of Visit," Chapter 3 in An Analysis of Survey Data on Physician Practice Costs and Incomes. Final Report, HCFA Contract No. 500-78-0018, April 1981.

Sloan, Frank A., Effects of Health Insurance on Physicians' Fees. Paper presented at the Southern Economic Association meetings, Washington, D.C.; October 1980.

Sloan, Frank A., and Roger Feldman, "Competition Among Physicians." In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 45-102.

Stano, Miron, The Pricing and Utilization of Physicians' Services, paper presented at Eastern Economic Association meetings in Washington, D. C., April 1978, pp. 1-19.

Steinwald, Bruce, and Frank A. Sloan, "Determinants of Physicians' Fees," Journal of Business, Vol. 47, October 1974, pp. 493-511.

Theodore, Chris N., and Judith S. Warner, "Physicians' Fees and the Source or Their Increase." In Health: A Victim or Cause of Inflation (Michael Zubkoff, ed.). New York: PRODIST (published for Milbank Memorial Fund), 1976, pp. 149-163.

Vahovich, Steven G., "Physicians' Supply Decisions by Specialty; 2565 Model," Industrial Relations, Vol. 16, No. 1, February 1977, pp. 51-60.

Wennberg, John, and Alan Gittelsohn, "Small Area Variations in Health Care Delivery," Science, Vol. 182, December 1973, pp. 1102-1108.

Wildavsky, Aaron, "Doing Better and Feeling Worse: The Political Pathology of Health Policy." In Doing Better and Feeling Worse: Health in the United States (John H. Knowles, ed.). New York: W. W. Norton & Company, 1977, pp. 108-109.

Yett, Donald E., "Comment" (on Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 103-120.

Yett, Donald E., William Der, Richard L. Ernst, and Joel W. Hay, A Model of Physician Pricing, Output, and Health Insurance Reimbursement: Findings from a Study of Two Blue Shield Plans' Claims Data. Working paper (HCFA Contract No.600-76-0160), 1980.

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part Four:

Physician Participation in Insured Medical Programs

By: Gene A. Markel

I. INTRODUCTION

To assure more effective coverage and service for their insured populations, while simultaneously pursuing price control and cost containment objectives, health insurance programs sometimes will attempt to secure the cooperation of health care providers. Typically, these cooperative arrangements seek to assure that the provider will accept the insurer's (or program's) fee allowance, and that the insured patient will be assisted in the claims submission process. As a quid pro quo, the insurer agrees to make payment of the allowed amount for the service directly to the provider, thereby relieving the provider of risks otherwise attendant to the fee collection process. For Blue Shield Plans, such an arrangement is referred to as physician participation. In the Medicare Part B program, the physician entering into such an arrangement is said to "accept assignment."

The central policy objectives, issues and implications surrounding such arrangements are more-or-less immediately obvious. Medicare seeks to realize the greatest possible rate of assignment acceptance, and Blue Shield wants to have as many participating physicians as possible. If participation and assignment rates are high, the insurance program's health care cost containment objectives will be more effectively satisfied. Concomitantly, the insured population will incur less out-of-pocket cost, since the participating or assignment-taking physician generally is required to accept the insurer's fee allowance as payment in full. When participation and assignment rates are lower, health care costs are less controlled, at least in the effective short term.

Controlled health care costs and smaller out-of-pocket expenses clearly are valuable payoffs for the health care consumer.

Further, the insured health care consumer may find that some assistance with the claims submission process is an almost equally valuable payoff. Policies and procedures for completing and submitting health insurance claims are frequently very complicated and difficult from the layman's point of view. A participating or assigning physician is expected to handle all of the necessary insurance paperwork for the insured patient, seeing to it that a claim form is properly completed and properly submitted, accompanied by any required supporting documentation. Not only is the insured patient relieved of this initial administrative burden; he/she may be somewhat better assured that the paperwork has been done correctly, and that the claim therefore will be processed more accurately and more quickly. This is a positive result for the entire system, as well as a valuable service to the individual insured consumer.

In general, however, the Medicare Program has not enjoyed particularly impressive rates of assignment acceptance by physicians. The Health Care Financing Administration (HCFA) has faced a major challenge in attempting to understand the factors influencing physicians' assignment acceptance decisions, and in acquiring knowledge and insights to help define policy directions through which rates of assignment acceptance might be increased. Similarly, Blue Shield Plans have not on the whole been satisfied with their physician participation rates; and in general there also is very little understanding of the factors related to physicians' Blue Shield participation decisions. This part of the Final Report describes and presents findings from a study which was conducted to

identify and obtain better understanding of the factors influencing these participation and assignment decisions among Pennsylvania physicians.

A. PENNSYLVANIA BLUE SHIELD REIMBURSEMENT SYSTEMS

Pennsylvania Blue Shield (PBS) offers two main kinds of benefit plans, each with its own distinctive approach to determining amounts to be allowed as reimbursement for reported services. These two main benefit plans and reimbursement schemes will be described briefly here, and discussed in relation to implications for the participating physician.

The most commonly held plan at PBS is the UCR Plan. This plan provides a relatively generous schedule of benefits. It features a reimbursement methodology originally designed with the intent of closely reflecting and following "going rates" in the medical marketplace in the determination of fee allowance limitations. For present purposes, this system will be described only in its broadest outlines. Essentially, it seeks to limit a physician's reimbursement for a given service to an amount that is determined to be usual, customary, and reasonable for the given service when provided by the given physician.

For each individual physician, a file is developed of his "usual" fees for each specific procedure he reports frequently enough to assure statistical validity. The usual fee for a given procedure for a given doctor is defined as the median value of the distribution of charges he has reported on claims for that procedure during the preceding year.

In addition, each physician is assigned to a peer group defined in such a way as to reflect similarities of professional training and

experience, and also to reflect similarities in economic characteristics of practice locale. The training and experience factors are taken into account by recognizing the physician's self-designated specialty of practice. To recognize differences in the medical market characteristics of different practice locales, the state has been geographically partitioned into four "charge class" areas. In general, the charge classes tend to reflect four different intervals on an urban-rural continuum, with corresponding degrees of variation in socioeconomic level. The "customary" charge screen for a given procedure for a peer group is defined to be the value found at the 90th percentile of the (weighted) distribution of usual charges for all physicians belonging to that peer group.

In the claims adjudication process, the "reasonable" fee allowance is determined as the smallest of: (1) the actual reported charge on the claim for the procedure; (2) the individual physician's usual charge for the reported procedure; or (3) the customary charge on file for the physician's peer group. A greater amount will be allowed only if it can be ascertained that there were unusual or extenuating circumstances in the delivery of the services, in which case an appropriate "reasonable" allowance amount is determined by special review. Both "usual" and "customary" charges are periodically updated.

A participating physician must accept the UCR allowance as payment in full for all covered services delivered to patients holding PBS UCR coverage. In addition, as indicated earlier, the claims paperwork is to be completed and submitted by the physician's own office staff. Payment on the claim is made directly to the physician.

PBS also offers two different fee schedule plans. For present purposes, they will be discussed as a single entity, since they are structurally similar from the standpoint of reimbursement methodology. The fee schedule plans have a fixed table of allowances applicable to all doctors statewide. In the claims adjudication process, the allowed fee is determined as the lesser of the actual reported charge on the claim, or the scheduled fee allowance for the reported procedure. In general, the fee schedule plans provide smaller payment allowances than the UCR Plan.

The fee schedule plans also are set up to operate as Service Benefit plans. This means that for covered patients with annual income below certain specified levels, the participating physician must accept the fee schedule allowance as payment in full (thus providing a "service benefit," as opposed to a simple indemnity). For patients with fee schedule coverage who have annual incomes greater than the threshold established for the service benefit means test, the physician -- whether participating or not -- has no obligation to accept the fee shedule allowance as full payment. In any event, however, the participating physician still is expected to have his office staff do the claims paperwork.

The participating doctor agreement at PBS is an all-or-nothing arrangement. The doctor either participates for <u>all</u> Blue Shield business that comes to him, or he doesn't participate at all. Participation cannot take place on a claim-by-claim basis. The participating physician is required to sign a contractually binding agreement.

B. MEDICARE REIMBURSEMENT AND ASSIGNMENT

The Medicare Part B reimbursement system operates essentially like the PBS UCR system described above. The basic mechanics are the same, but the terminology and some of the system parameters are different.

In the Medicare system, there is for each individual physician a file of his "customary" charges for each specific procedure he reports often enough to assure statistical validity. The Medicare "customary" is analogous to the Blue Shield "usual," and is similarly defined as the median value of the distribution of actual charges reported on claims during the preceding calendar year.

The Medicare system at PBS also employs the same peer group structure and peer group definitions as are used in the PBS private UCR system. Peer group "prevailing" charge screens are determined, analogous to the "customary" charge screens in the PBS UCR system. The Medicare "prevailing" charge screen, however, is calculated at the 75th percentile of the (weighted) distribution of customary charges for all physicians in the peer group -- as opposed to the 90th percentile parameter used in the PBS UCR system. In addition, since 1976, Medicare prevailing charges have been still further constrained by a mandated economic index designed to reflect practice costs and general earning levels.

In claims adjudication, the "reasonable" fee allowance is determined as the smallest of: (1) the actual reported charge on the claim for the procedure; (2) the individual physician's customary charge for the reported procedure; or (3) the prevailing fee on file for the physician's peer group. Again as in the PBS UCR system, a greater amount can be

allowed after special review only in the event of unusual or extenuating clinical circumstances. Medicare customary and prevailing charges are updated annually.

The amount paid by the Medicare program is 80 percent of the allowable amount for the service, with the beneficiary responsible for a 20 percent cost share. There also is a modest initial deductible each year.

The physician is allowed to take assignment on a claim-by-claim basis. If he takes assignment, he must accept the allowed fee as payment in full for the services covered by that claim. The 80 percent payment is sent directly to the physician, and it is his responsibiliy to collect the 20 percent cost sharing amount from the beneficiary. He cannot, however, collect anything additional from the beneficiary beyond the beneficiary's legally mandated 20 percent share of the allowed charge. The physician also is responsible for the beneficiary's claims paperwork on an assigned claim.

If the physician does not take assignment on a claim, the beneficiary is responsible for his own claims paperwork (although many doctors will do this for Medicare beneficiaries, even though not required to). A payment in the amount of 80 percent of the allowed fee is mailed directly to the beneficiary. The physician is responsible for collecting from the beneficiary, and may attempt to collect any amount he thinks his service is worth. He is not constrained by the "allowed" amount, but may or may not in fact succeed in collecting his fee.

C. SUMMARY OF FINDINGS

A descriptive and analytic approach was taken in this study to seek out empirical patterns of Blue Shield participation and Medicare assignment, to identify and explore factors related to physicians' participation and assignment decisions, and to differentiate the characteristics of those who do and do not participate and take assignment. Beyond the purely descriptive elements, the basic approach is an analysis of variance.

It is found that on average Pennsylvania physicians take assignment on 37.7 percent of their Medicare line items and 45.1 percent of their billed charges under the Medicare program. The distribution of physicians with respect to Medicare assignment rates is generally U-shaped, indicating a tendency toward a bipolar response pattern. Most physicians either consistently accept or consistently decline assignment. Specifically, 14.0 percent consistently (on at least 90 percent of line items) accept assignment, and 40.2 percent consistently decline assignment (taking assignment on 10 percent or less of line items).

For Blue Shield programs, it was found that 87.5 percent of physicians participate with Blue Shield. Although this rate is a bit higher than indicated by PBS company sources, the difference can easily be reconciled, and 87.5 percent probably is a reasonably reliable estimate of the participation rate for physicians submitting Blue Shield claims with some regularity.

In a more detailed examination of Medicare assignment behavior, it was found that there is considerable variation by specialty. Specialists

tend to have higher assignment rates than generalists, with medical and surgical specialists having assignment rates slightly greater than 42 percent, and generalists having an average assignment rate of 27.5 percent.

Board certified physicians have higher average assignment rates than those without such credentials, with 42.0 percent and 34.7 percent, respectively. FMG physicians on the average take assignment on 55.5 percent of their line items, which is much higher than the average for all others. It also is found that older physicians have lower assignment rates, while younger physicians have higher rates. Those in the youngest age decile take assignment on 58.0 percent of line items, and those in the oldest decile assign 22.0 percent.

It is conjectured that physicians' Medicare assignment rates may be determined to some extent by the characteristics of their practices with Medicare patients. Among the factors examined, the most important were found to be the mean annual billing per Medicare patient, total annual Medicare billings, mean charge per Medicare service, and number of different Medicare patients seen in a year. High Medicare assignment rates are associated with higher values on all of these factors. Similar and analogous relationships hold with regard to the physician's overall practice.

Twenty-five different factors are examined as key characteristics to describe the physician's practice locale. These are organized into three main subgroups: (1) general demographic and socioeconomic factors; (2) factors describing the local medical services economy; and (3) factors serving as indicators of health insurance and medical subsidization. Some

of the more important factors from the first subgroup were found to be population density, unemployment rate, and liberal-conservative political orientation. In the second group, hospital bed supply and primary care physician supply were important. From the third group, it became apparent that money entering the local medical services economy from insurance and government medical programs contributes to higher assignment rates.

In the case of Blue Shield participation, many of the Medicare assignment findings were reversed. Specialists were found to have lower participation than generalists. General practice physicians showed a 92.6 percent participation rate, while surgical specialists were low with 81.9 percent. The Medicare trends also were reversed for board certification and physician's age. Board certified physicians had an 83.4 percent participation rate, while those not board certified were higher, at 90.5 percent. Older physicians tended to have greater participation rates, with the oldest decile at 89.3 percent and the youngest at 85.7 percent. By source of medical education, FMGs had the highest participation rate, paralleling the Medicare findings in this instance.

The findings with respect to practice characteristics also were, in general, reversed from the findings for Medicare assignment. The effects of practice locality characteristics, on the other hand, were similar to the findings for Medicare. It was noted, however, that all of the effects pertaining to Blue Shield participation were much weaker than the effects observed for Medicare assignment.

On the whole, it is felt that Medicare assignment is reasonably rationally explained, but Blue Shield participation is much more difficult to understand and explain.

II. CONCEPTUAL AND ANALYTICAL FRAMEWORK

A. PREVIOUS STUDIES OF ASSIGNMENT AND PARTICIPATION

Significant previous research in the area of Medicare Part B assignment has been done by Huang and Koropecky (1973), Ferry et al. (1980), Paringer (1980), and Mitchell and Cromwell (1981). The latter, by Mitchell and Cromwell, is based primarily upon relatively recent national survey data, and must be recognized as the most comprehensive and definitive treatment of this subject to date. In additon, Sloan, Mitchell, and Cromwell (1978) have examined issues and factors related to physician participation in state Medicaid programs. Even though the Medicaid program and its market are substantially different in many ways from either Medicare or Blue Shield, results from this work still may have some applicability to related issues in Medicare assignment and Blue Shield participation. This work was further extended by Mitchell, Cromwell, and Schurman (1981) for an analysis of the joint Medicare-Medicaid participation decision. Previous research on Blue Shield participation is very scant. Sloan and Steinwald (1978), using 1973 data on a national sample of physicians, examined the motivations for, and the determinants of, physicians' decisions to participate in Blue Shield. Yett et al. (1981) reported a study of factors related to the participation decision, based upon data from two Blue Shield Plans. Previous work on participation and assignment in health insurance programs has been both theoretical and empirical.

1. Conceptual Model of Market

Most of the work cited above has been based upon a theoretical framework which views the physician as a profit maximizer operating in two or more different markets. For simplicity and expediency, this expository review will be framed in terms of a two-market situation. The extension to more than two markets is conceptually straightforward.

The first market is a private uninsured or nonparticipating market, in which the physician acts as a price-setter with a traditionally downward-sloping demand curve and marginal revenue curve. The second is a market for participating and/or assigned services, in which he is (either in fact or in effect) confronted with a fixed (at least in the short run) schedule of fee allowances for his services. In this second market, he acts as a price-taker operating against a horizontal marginal revenue curve, at least until his demand here is effectively exhausted. The model in general assumes a single cost function for his activity in either or both markets.

With this conceptual framework, rational economic behavior dictates that the physician will first exhibit a preference for the private, nonparticipating, and/or unassigned market. He will continue to have a preference for this market, and will operate solely or predominantly in this market, until its downward-sloping marginal revenue curve intersects the horizontal marginal revenue curve of the second market. At this point, he will shift his preference to the second market, since for any demand beyond this point the marginal revenue curve for the second market dominates that of the first. If the physician has any remaining capacity after demand in the second market has been effectively

exhausted, he will immediately drop vertically to operate again on the downward-sloping marginal revenue curve for whatever profitable portion of the first market may remain. (In the event that more than two markets are postulated, he will move to whichever is the most profitable remaining market.)

For a more extensive and detailed discussion of this analytical framework as it would be applied to a multiple-market situation, see Mitchell, Cromwell, and Schurman (1981). An application of the model specifically to the Medicare market is detailed extensively in Mitchell and Cromwell (1981). A somewhat briefer, but still relatively complete, exposition of this conceptualization as it may be applied to Medicare can be found in Paringer (1980).

2. Implications and Expected Results from Theory

On the basis of the theoretical construct described above, one can predict a number of effects to be anticipated for physician response to the assignment/participation decision in such a market. The following is a summary of some of the salient implications.

An effect of major importance in this conceptual model is that any increase in fee allowances for a program in the assigned/participating market will yield increased rates of assignment acceptance and program participation. This follows since an increase in fee allowances is tantamount to an upward shift in the horizontal marginal revenue curve for the second (assigned/participating) market. The upward shift in the marginal revenue function raises the price level, and correspondingly reduces the quantity threshold, at which the physician will find it

attractive to depart from the downward-sloping marginal revenue curve of the relatively more free first market.

As a corollary to this, it also follows that an increase in the severity of cut-backs from billed to allowed charges should reduce the rates of assignment acceptance and participation. A negative response to fee cut-backs also is intuitively foreseeable as a psychologically motivated response on the part of physicians.

To the extent that more stringent and demanding administrative practices and compliance requirements may increase operating costs for program participants, such policies would tend to contribute to an upward shift in the participating physician's marginal cost function -- and hence would provide incentives to reduce the extent of participation in both markets. In practical terms, this effect would impact most essentially upon the assigned/participating market. Again, more stringent administrative requirements intuitively may be assumed to provide psychological -- as well as economic -- disincentives to assignment and/or participation.

Any other factor contributing to higher practice costs -- such as, for instance, office wages -- similarly may be expected to be associated with reduced assignment/participation.

If it can be assumed that a physician's skills tend to deteriorate with advancing age, then the physician's age could be perceived by consumers as a quality-of-service factor which would tend to reduce the demand for the services of older physicians. As the demand curve shifts inward, this theoretically should diminish the size of the unassigned/nonparticipating market available to the older physician, and

hence would induce him toward heavier participation in the assigned/participating market. This assumption has in fact been made in some of the prior studies cited above. The theoretical relationship between physician age (or years of experience) and the physician's market behavior with respect to the assignment/participation decision nevertheless remains somewhat ambiguous.

Other factors presumed to be related to the quality of a physician's services, and hence commonly used as proxies for quality, are specialty status, board certification, and identification as a foreign medical graduate (FMG). Specialty status and board certification would be presumed to be indicators of greater quality, and thus would increase the overall demand for a physician's services and reduce his participation in the assigned/participating market. FMGs sometimes are regarded as having inferior training, and thus, as providing lower quality services. If so, they may be expected to be less in demand and to show greater assignment/participation rates.

Among other demand variables commonly found (or conjectured) to have an important influence on the markets for physicians' services, a higher physician-to-population ratio should be expected to reduce the free market demand for individual physicians' services. If the physician's opportunity to participate in the unassigned/nonparticipating (i.e., "free") market is thus diminished, he may be expected to show a heightened interest in the assigned/participating market. Greater supplies of physicians relative to a market area's population base therefore may be anticipated to be associated with higher rates of assignment and participation. Higher patient (or population) income conversely may be

expected to increase free market demand for services, and consequently may induce smaller assignment/participation rates. It also has been hypothesized that greater amounts of more generous private insurance in a market area should tend to reduce the attractiveness of publicly-funded assigned/participating markets for most physicians.

3. Alternative Market Model for Blue Shield Participation

In addressing the question of a theoretical framework for analyzing physicians' Blue Shield participation decisions, Yett et al. (1981) take the position that a discrete optimization model is more appropriate than the multiple-market model described above. In this model, the physician is assumed to be faced with a discrete market choice between participating or not participating (as opposed to the continuous, or claim-by-claim, decision process which may be implied by the other model), and is assumed to make the choice which will maximize profit.

The implications of the discrete model are much less clear than those of the multiple-market model. While some of the effects summarized above for the multiple-market model still may be expected, others cannot. In general, theoretical outcomes arising from outward shifts in the demand function in the nonparticipating submarket, or from upward shifts in marginal cost for both submarkets, will be indeterminate. The upshot is a greater dependency on empirical determination of outcomes that may be associated with given changes or parameter variations in the market.

4. Empirical Results and Findings from Previous Studies

In a collective overview of the studies cited above, it may be noted that nearly all of these studies included a test of the relationship of fee allowance levels to assignment/participation rates. As expected, assignment/participation rates were uniformly found to increase with more generous fee allowances for programs operating in the assigned/participating market. The effect, moreover, was generally found to be of a substantial magnitude, with fee allowance levels frequently emerging as a dominant factor. This apparent high level of concern focusing upon fee allowance levels in the physician's assignment/participation decision process also is consistent with the findings of a recent in-house study of physician participation conducted by Pennsylvania Blue Shield (1981). In focus group interviews with four different panels of ten physicians each, as well as in a carefully designed mail questionnaire survey among a stratified sample of 1,304 Pennsylvania physicians, dissatisfaction with fee allowances emerged as the dominant theme associated with nonparticipation.

Paringer (1980) found Medicare assignment acceptance to decrease in response to higher private price levels for a physician; and Yett et al. (1981) similarly found lower rates of Blue Shield participation for physicians with higher prices.

Supporting a corollary expectation arising from the price and allowed chargé phenomena reported above, Mitchell and Cromwell (1981) found Medicare assignment rates to decrease as the relative cut-back from billed to allowed charge grew larger. Paringer, on somewhat weaker evidence, speculates on the same effect. In popular intuition, the

existence of any significant gaps between billed and allowed charges has long been suspected of being an important contributory factor in many physicians' decisions not to accept Medicare assignment or not to participate in Blue Shield.

Quality factors on the whole behaved as predicted. Better credentials, as reflected by specialty practice and board certification, tended to be associated with lower assignment/participation rates. In addition, nearly all of the cited studies included an examination of the effects of FMG status; and they uniformly found FMGs to have higher assignment/participation rates.

The effect of office wages as a cost factor was mixed. Mitchell and Cromwell found the office wage factor to be significant, but in the opposite direction from that predicted by theory. Yett found the observed effects of the office wage factor to be inconclusive.

The effects of population (or patient) income were exactly and uniformly as predicted. Higher income levels in the patient population base were found to be associated with lower rates of assignment and participation.

The physician-to-population ratio had effects that were mixed, inconclusive, and often contrary to theory. Huang and Koropecky (1973) found mixed effects here. The studies by Mitchell and Cromwell (1981) and by Sloan, Mitchell, and Cromwell (1978) showed results that were in the wrong direction from that predicted by theory -- i.e., the results showed assignment/participation rates decreasing with increasing physician-to-population ratios. The results of Sloan and Steinwald (1978) were in the theoretically correct direction, but were not significant. Yett's

results were mixed, and in some cases not significant. It has been speculated that the empirical observation of assignment and participation rates decreasing as physician-population ratios increase could be evidence of physician-induced demand.

Finally, political conservatism was found by Mitchell and Cromwell to be associated with lower Medicare assignment rates, as many have hypothesized.

B. SCOPE AND ANALYTICAL APPROACH FOR PRESENT STUDY

The bulk of the preceding work, as cited and summarized above, has tended to employ the models, methods, and perspectives of a strict econometric approach. The present study and results reported here tend to be more essentially descriptive. Analytic aspects of this work are directed toward a systematic isolation and examination of the salient factors appearing to influence, or to be associated with, physician assignment and participation in health insurance programs. Beyond its purely descriptive elements, this study seeks first to identify -- from a very large set of potentially related variables -- those variables most significantly related to physician assignment acceptance under Medicare and physician participation in Blue Shield. This includes a determination of the basic nature of the observed effects -- i.e., the direction in which each effect is seen to operate, and at least a rough indication of the relative strength or impact of the various significantly influential factors.

Perhaps the most fundamental difference between this work and any of the work reported earlier (as cited above) is that this work takes a much less purely economic perspective on the subject matter. The underlying viewpoint or philosophy is that the phenomena surrounding physician assignment and participation in health insurance programs are not necessarily purely economic, and that it may be possible to obtain some useful new or extended insights by departing from the strict confines of a conceptual framework based upon tightly defined econometric models and economically motivated a priori conceptualizations. The approach taken is basically a heuristic discovery process. There is no intent or design to achieve precise estimation of the parameters of a specified economic model.

Another vital and positive difference in this study is its use of a data base that, although limited to Pennsylvania physicians, is in every other respect the most extensive and richest data set yet brought to bear on any of these problems. In large measure, in fact, it is the very size of the available data resources that dictates a somewhat different viewpoint in conceiving an approach to the study. Beginning with an extraordinarily large data set, a greater than usual emphasis and share of the effort was focused upon simply achieving an orderly, systematic, and constructively directed reduction of variables. The study data base and variables are described later, in Section III.

Methods employed in reducing the set of variables to a manageable size, while isolating and examining those factors appearing to be most importantly related to physician assignment and participation, included correlation analysis, factor analysis, and analysis of variance (ANOVA).

The correlation and factor analysis phases of the work primarily served the purpose of providing preliminary insights into the general structure of the data set, identifying patterns of relationship and interdependence between the several variables in the beginning data set. The substantially reduced data set emerging from this phase of analysis then was subjected to a more detailed and critical analysis through an extensive series of one-way ANOVA. The ANOVA results comprise the principal findings from the study.

III. DATA BASE

An extensive data base of detailed information on prices and quantities of services delivered by Pennsylvania physicians has been compiled to support this study of physician behavior under the Medicare assignment and Blue Shield participation options -- as well as to support the related studies of physician pricing practices and of factors related to physician pricing behavior described in other parts of this Final Report. Data have been collected and retained at the level of the individual physician for more than 11,000 Pennsylvania physicians. These price and quantity data have been extracted from claims transaction files created in connection with claims processing operations at Pennsylania Blue Shield covering both the Medicare Part B and private Blue Shield programs. The study focuses upon forty-four representative, well-defined, and frequently performed procedures, in a 1975 time frame. Physicians represented in the data base are all those who reported claims within a given line of business (i.e., Medicare or Blue Shield) for at least ten services for any of the forty-four criterion procedures during the year 1975.

A matched data base of individual physician characteristics also was developed. Drawing upon American Medical Associaton (AMA) and American Osteopathic Association (AOA) reference sources, as well as upon various in-house PBS files, nearly 10,000 physicians from the price and quantity data file were matched to produce an extensive and detailed composite physician characteristics file.

An additional file was developed containing more than sixty variables to describe each of Pennsylvania's sixty-seven counties. The information in the county data file was attached to the physician characteristics file by virtue of knowledge of the county in which each physician practices. These county level data were used as the best available information to characterize each physician's practice locale.

Since PBS private Blue Shield and Medicare claims experience files provided one of the primary sources from which this data base was developed, it should be noted that claims data bases are notorious for the inaccurate and spurious data they contain. These source data problems arise from a variety of causes -- e.g., miscoding, erroneous reporting, data entry errors, supplemental claims relating to old claims appearing as new claims, and others. Meticulous data quality control procedures were employed in the development of the data base for this project to assure that incorrect, spurious, and invalid data have been (to the greatest extent possible) detected and filtered out.

A. DATA BASE FOR STUDY OF ASSIGNMENT AND PARTICIPATION

This study of Medicare assignment and Blue Shield participation thus is based upon an extensive and carefully quality-controlled data base for the time frame 1975. The data set contains approximately 150 data items for each of 9,827 Pennsylvania physicians, spanning personal physician characteristics, practice characteristics, and characteristics of practice locale for each individual physician. Of the 9,827 physicians represented in the data base, 8,322 (84.7%) are represented for private Blue Shield

experience; 9,102 (92.6%) have Medicare experience; and 7,597 (77.3%) have experience in both lines of business.

Doctors of Medicine (M.D.) comprise 88.7 percent of the sample; Doctors of Osteopathy (D.O.) comprise the remaining 11.3 percent.

A breakdown by specialty shows (for some illustrative major specialties) 2,547 (25.9%) in general practice, 823 (8.4%) in family practice, 935 (9.5%) in general surgery, 646 (6.4%) in obstetrics-gynecology, and 1,414 (14.4%) in internal medicine. These are self-designated specialties. In broad summary, the physician sample consists of 34.4 percent in general or family practice, 27.8 percent in medical specialties, 32.5 percent in surgical specialties, and 5.4 percent in other specialties (anesthesiology, radiology, pathology, etc.).

Board certification credentials are held by 42.3 percent. National professional association (AMA or AOA) membership is held by 77.3 percent. Professional schools within the state of Pennsylania produced 68.4 percent of the physicians in the sample; 21.5 percent are from other medical schools throughout the United States; and 10.1 percent are foreign medical graduates (FMGs).

To the extent that master listings were available to facilitate checking of these sample distributions, it can be said that the distributions for all stratifications in the sample are highly representative of the actual stratification reflected in the PBS physician masterfile and other authoritative sources.

B. REDUCED VARIABLE LIST FOR ANALYSIS OF VARIANCE

The complete original variable list in the data set for each physician contained a great many variables which ultimately turned out to have little or questionable significance, or which accounted for negligible proportions of the variance in the response variables. In addition, the full starting set of variables contained a number of subsets of deliberately redundant variables -- i.e., different variables to measure more-or-less the same thing. For example, mean family income, median family income, and per capita income all were included as available alternative population income measures. One of the objectives was to determine which variable, from among such a set of alternatives, would be most effective in terms of strength of relationship to the response variable(s), and/or would be less confounded with other candidate independent variables. For brevity, and because there would be little value to be served for present purposes, there will be no discussion here of the many variables which were discarded in the process of reducing the data set. The remainder of this discussion will concentrate upon the relatively smaller set of variables which ultimately were carried through into the ANOVA and which were found to be of some interest or significance there.

1. Dependent Variables

All of the analysis was at the individual physician level. The data record for each physician contained a dichotomous variable to indicate participation or nonparticipation with Blue Shield. This served

as the response variable for the analyses of Blue Shield participation.

For the analyses of Medicare assignment rates, the response variables in each physician's record (assuming more than zero Medicare services reported by the physician) were the relative percentage of claim line items reported by the physician on which assignment was taken, and the relative percentage of the physician's billed charges on which assignment was taken. The claims transaction experience files created during, and remaining from, the claims processing and payment operation do not readily permit the reconstruction of whole original claims. The available transaction record is the "claim line item," which represents a single (and therefore homogenous) kind of service. For purposes of analyses using data derived from original claim transaction source files, the common practice (at least at PBS) is to consider line item records as rough surrogates for claim records. Most claims in any event contain only a single line item. Hence, it is a simple expedient to measure assignment rate in terms of line items accepted for assignment, as a proxy for claims accepted on assignment.

2. Basic Physician Characteristics

The record for each individual physician indicates his location of practice (county), degree (M.D. or D.O.), practice specialty, broad specialty category (general, medical, surgical, or other), medical school from which graduated, and status with respect to board certification and national professional association membership. A summary of frequency distributions for each of these nominal variables already has been given.

In addition, the record indicates the physician's age (as of 1975). The original data set also contained a variable indicating number of years since licensure, but this was dropped from the final stage analyses, since in most cases it carried roughly the same informational value as the physician's age variable.

Finally, the record also includes a variable showing the number of physician associates with whom the physician is involved in his practice. This serves as a proxy for determining whether the physician practices solo, small partnership, or group. If two or more physicians practice together as a single business entity, they may establish an "assignment account" with PBS. Checks for allowed payments then are written to the assignment account instead of to individual member physicians. There is no record at PBS to indicate whether a physician's mode of practice is solo, partnership, or group, per se. There are, however, cross-reference files indicating membership in assignment accounts; and from these files it is possible to determine the number of other physicians with whom a given physcian has business association in his practice. It is assumed that business association implies clinical association.

3. Individual Physician Practice Characteristics

Several variables were derived from the data found in PBS claims transaction files (both Medicare and private Blue Shield) for each physician, to reflect some of the summary patterns and characteristics of his practice. Following is a list of those which were carried into the ANOVA and which provide the main substance of the findings given later.

(a) Number of Patients Seen. This gives the number of distinctly different patients seen by the physician during the course of the year, as reflected by claims transaction records. Three different variables were developed to give the number of Blue Shield patients, the number of Medicare beneficiaries, and the total number of patients seen (taking Medicare and Blue Shield together). These variables indicate the sizes of the patient rosters served by physicians under two different insured programs and in aggregate.

(b) Percent of Patients Medicare. Derived from the above, this variable indicates the annual number of different Medicare patients seen as a proportion of the total number of Medicare and Blue Shield patients in aggregate.

(c) Number of Services. Three variables give, respectively, the annual total number of services reported for Blue Shield, Medicare, and in aggregate. This serves as a measure of activity, but does not differentiate between qualitatively different kinds of services, and hence cannot be interpreted as a productivity measure.

(d) Billings. Three different variables give the total annual dollar volume of a physician's billings reported on claims submitted to PBS for Blue Shield, Medicare, and in aggregate.

(e) Allowed-to-Billed Ratio. This is a measure of the relative cut-back from a physician's billed charges to the amounts allowed by the insurance carrier or program. Specifically, it represents the proportion or percentage of a physician's billed charges for the year which have been allowed as "reasonable." The relative size of the cut-backs being imposed on a physician commonly is regarded as a dominant consideration in his assignment/participation decision. The data set contains three variables giving this ratio, respectively, for Blue Shield, Medicare, and in aggregate.

(f) Mean Charge per Service. In common parlance, this serves as an indicator of whether the physician deals in "big ticket" services or in relatively lesser valued services. Three variables again have been calculated -- for Blue Shield services, for Medicare services, and for the aggregate.

(g) Mean Services per Patient. This serves as a measure of the intensity of the physician's activity relative to his patient roster. If the services being compared are relatively homogenous, a high value on this variable relative to the norm might indicate a physician who is overutilizing (or inducing demand for his own services). This variable is calculated for Blue Shield, for Medicare, and for the aggregate.

(h) Mean Annual Billing per Patient. This has rather straightforward meaning and is calculated for Blue Shield,

for Medicare, and for the aggregate.

(i) Percent UCR. This is a single variable indicating the proportion of the physician's services to Blue Shield patients which are covered and reimbursed under the UCR program. It is included because of the long-standing interest in role and impact of UCR reimbursement methodologies in the medical marketplace. One may conjecture, for instance, that where there is more UCR, there would be a higher effective price on transactions -- and that this ultimately could impact on the participation decision.

(j) Relative Price Index. This is a cross-sectional price relative, giving for each physician a composite measure of his price levels relative to statewide average price levels, weighted by the mix of services for the individual physician. Separate indexes have been calculated for a physician's experience in the Blue Shield market, in the Medicare market, and in the aggregate. The statewide average price and service mix would be represented by an index value of 100.

It should be noted that all of the above measures used to characterize a physician's practice are determined only on the basis of what is available in private Blue Shield and Medicare Part B claims transaction files at PBS. In some cases, therefore, the measures may be somewhat imperfect since they cannot reflect a physician's uninsured

activity, Medicaid activity (except for joint Medicare/Medicaid), or activity under commercial insurance programs. There is no knowledge of such activity from the sources used. On the other hand, it also may be noted that this problem is assuaged somewhat by the fact that PBS has a very dominant share of the health insurance market in the state of Pennsylvania, covering close to two-thirds of the state's population under Medicare and private Blue Shield combined.

Table 4-1 displays a summary list of the physician variables discussed above (other than nominal-level variables), showing selected distribution parameters for each variable (population mean, coefficient of variation, and skewness).

4. Practice Locale (County) Variables

Each physician's practice locale is identified and characterized at the county level. These county data were gathered primarily from standard open reference sources, augmented by data derived from PBS in-house files. The county variables carried through to the ANOVA stage are listed below, sorted into three main groups: (a) general demographic and socioeconomic variables; (b) price, cost, and supply factors associated specifically with the medical services economy; and (c) medical care insurance and subsidization factors.

(a) General Demographic and Socioeconomic Factors:

Population density

Per capita income

Median years education

TABLE 4-1. PERSONAL AND PRACTICE CHARACTERISTICS OF PENNSYLVANIA PHYSICIANS (1975)

Variable/Description	Mean	C.V.	Skewness
Mean number of physician associates	2.18	3.94	4.963
Physician age	52.1	.23	.204
Number of years licensed	25.8	.49	.240
Number of Blue Shield patients	127.4	1.76	8.174
Number of Blue Shield services	457.2	1.60	5.054
Total Blue Shield billings	$17,700	1.51	3.470
Blue Shield allowed/billed charge ratio	.786	.17	-.846
Mean charge per Blue Shield service	$53.85	1.48	7.640
Mean services per Blue Shield patient	3.34	.83	3.572
Mean annual billing per BS patient	$113.38	1.03	5.065
Percent BS services UCR	66.4	.32	-.671
Blue Shield price index	96.2	.27	1.031
Number of Medicare patients	119.0	1.15	4.067
Percent of patients Medicare	58.4	.55	-.282
Number of Medicare services	1,029	1.31	3.175
Total Medicare billings	$17,591	1.32	3.937
Medicare allowed/billed charge ratio	.858	.10	-1.170
Mean charge per Medicare service	$27.22	1.52	9.146
Mean services per Medicare patient	8.11	.78	1.985
Mean annual billing per Medicare patient	$128.65	.76	3.182
Medicare price index	100.5	.29	1.198
Total number of patients (BS+Medicare)	246.4	1.24	5.936
Aggregate number of services	1,341	1.29	3.314
Aggregate annual billing	$31,282	1.31	3.595
Aggregate allowed/billed ratio	.830	.12	-.964
Aggregate mean charge per service	$37.22	1.54	7.255
Aggregate mean services per patient	6.36	.81	2.385
Aggregate mean annual billing per patient	$123.76	.81	4.452
Aggregate price index	98.6	.28	1.164

Percent college graduates in population

Percent laborers in workforce

Percent workforce unemployed

Percent of families below poverty level

Percent conservative

Consumer price index (CPI)

(b) Medical Service Economy:

Price indexes for physicians' services

Mean monthly office payroll

Mean monthly pay per office employee

Number of beds in general hospitals

Hospital beds per 100,000 population

Number of direct patient care (DPC) physicians

Number of primary care (PC) physicians

Direct patient care physicians per 100,000

Primary care physicians per 100,000

(c) Health Care Insurance and Subsidization:

Blue Shield enrollment

Blue Shield population penetration

Percent physicians participating Blue Shield

Total Blue Shield payments

Percent Medicare claims (line items) assigned

Total Medicare allowed charges

Per capita state medical expenditures

In group (a), all but the last two variables have definitions and potential relevance that should be familiar and well understood.

The "percent conservative" was determined from state voting records for the 1972 and 1976 national presidential elections. Those voting for Republican or Constitutional party candidates were classed as "conservative." Those voting for candidates of the Democrat or other liberal-oriented parties were classed "liberal." Votes shown as being cast for "others" were not counted, since there was no basis for determining liberal-conservative preference in these votes. The resulting variable provides an indicator of the relative political positioning of each county's population on a liberal-conservative scale. It has often been posited that liberal orientations are associated with higher rates of assignment and participation in health insurance programs.

CPI data at the county level are not available from the government or from any routinely published sources. To provide a measure of the relative cost of living in each county, the parameters of an OLS regression equation were estimated from federal CPI data, with selected population and economic indicators serving as independent variables, for Standard Metropolitan Statistical Areas (SMSAs) in and around Pennsylvania. Estimated county-level CPI figures then were projected by plugging the required population and economic indicators for each county into the regression equation.

In group (b), the "price indexes for physicians' services" are cross-sectional price relatives developed separately for Blue Shield and Medicare activity in each county. In each case, the county price index

reflects the aggregate price of the mix of services reflected in actual Blue Shield or Medicare experience files for that county, calculated at average local prices in that county, relative to the aggregate price of the same package of services at statewide average prices.

Also in group (b), the mean monthly payroll per physician's office and the mean monthly pay per employee in physicians' offices are two alternative variables which may serve as proxies for the office expense cost factor in office-based physician practices in each county.

Hospital bed supply and physician manpower supply are given both in terms of absolute numbers and relative to the population base in each county. The physician-to-population ratio is the form most commonly used by researchers, but the preliminary data reductions in this study frequently showed the absolute number form of the variable to have a stronger relationship to response variables.

In group (c), "Blue Shield enrollment" refers to the estimated actual number of Blue Shield subscribers in a county. A "subscriber" is defined as anyone covered under a Blue Shield agreement, including family members as well as the specific individual in whose name the agreement was issued. "Blue Shield population penetration" is defined here as the percentage of the county population who are estimated to be Blue Shield subscribers.

Per capita state expenditure includes all expenditures by the state government for programs with direct medically-related purposes.

Table 4-2 provides a summary listing of these variables, characterizing their distributions in terms of population means, coefficients of variation, and skewness. It should be remembered that

TABLE 4-2. PRACTICE LOCALE (COUNTY) CHARACTERISTICS AND DISTRIBUTION PARAMETERS (c. 1975)

Variable/Description	Mean	C.V.	Skewness
Population density (per sq. mi.)	3,997	1.41	1.202
Per capita income	$3,172	.16	.759
Median years education	11.66	.05	-.293
Percent college graduates in population	9.08	.42	1.171
Percent laborers in workforce	4.76	.24	.795
Percent workforce unemployed	5.67	.22	-.299
Percent of families below poverty level	7.81	.37	.244
Percent conservative	47.37	.21	-.214
Consumer price index (CPI)	116.4	.04	-.739
County level Blue Shield price index	101.4	.12	-.152
County level Medicare price index	98.5	.11	-.180
Mean monthly office payroll	$4,806	.21	.042
Mean monthly pay per office employee	$1,307	.17	.047
Number of beds in general hospitals	4,651	1.04	.617
Hospital beds per 100,000 population	480.1	.39	.179
Number of direct patient care physicians	984.5	.85	.240
Number of primary care physicians	440.9	.90	.603
DPC physicians per 100,000	114.2	.34	1.917
PC physicians per 100,000	50.7	.24	.355
Blue Shield enrollment	554,830	1.04	.545
Blue Shield population penetration	54.5%	.41	-.254
Percent physicians participating BS	82.5%	.08	-.582
Total Blue Shield payments ($ millions)	$16.667	.94	.458
Percent Medicare claims assigned	48.1%	.29	-.446
Total Medicare allowed charges ($ millions)	$24.956	1.09	.870
Per capita state medical expenditure	$68.38	.56	2.380

these are not "average county" data distributions. Rather, they are distributions which follow and reflect the distribution of individual physicians by county.

IV. FINDINGS: MEDICARE ASSIGNMENT

Physicians in this study showed an average line item assignment rate of 37.7 percent. This is the unweighted mean of the individual line item assignment acceptance rates calculated for each of the 9,102 physicians represented in the Medicare experience portion of the study data base, and should not be confused with an aggregate assignment rate for all claims represented in the data base (which would be higher). The corresponding average assignment rate on billed charges was 45.1 percent -- i.e., the physicians in this sample on average took assignment on 45.1 percent of the billed charges they (or their patients) submitted to the Medicare carrier (PBS) for payment.

The bar charts in Figures 1(a) and 1(b) show the distribution of the physician population response rates to the Medicare assignment option, with individual physician assignment rates coded into 10 percent intervals. Figure 1(a) shows that line item assignment rates have a distribution that is roughly U-shaped, indicating a tendency toward a bipolar response to the Medicare assignment option. It can be seen that 14.0 percent of physicians always, or nearly always, take assignment; and 40.2 percent never, or hardly ever, take assignment. More than half of the physicians (54.2 percent) are concentrated into the ten percent response intervals at either end of the distribution. Very few -- only 9.5 percent -- are in the 41 percent to 60 percent range, which is the zone of maximum indeterminacy for the assignment decision. These are physicians for whom there would be roughly equal likelihood of taking or rejecting assignment on any given claim, and who therefore are most likely

FIGURE 1(a). Percentages of Physicians Taking Assignment on Given Percentages of Medicare Line Items

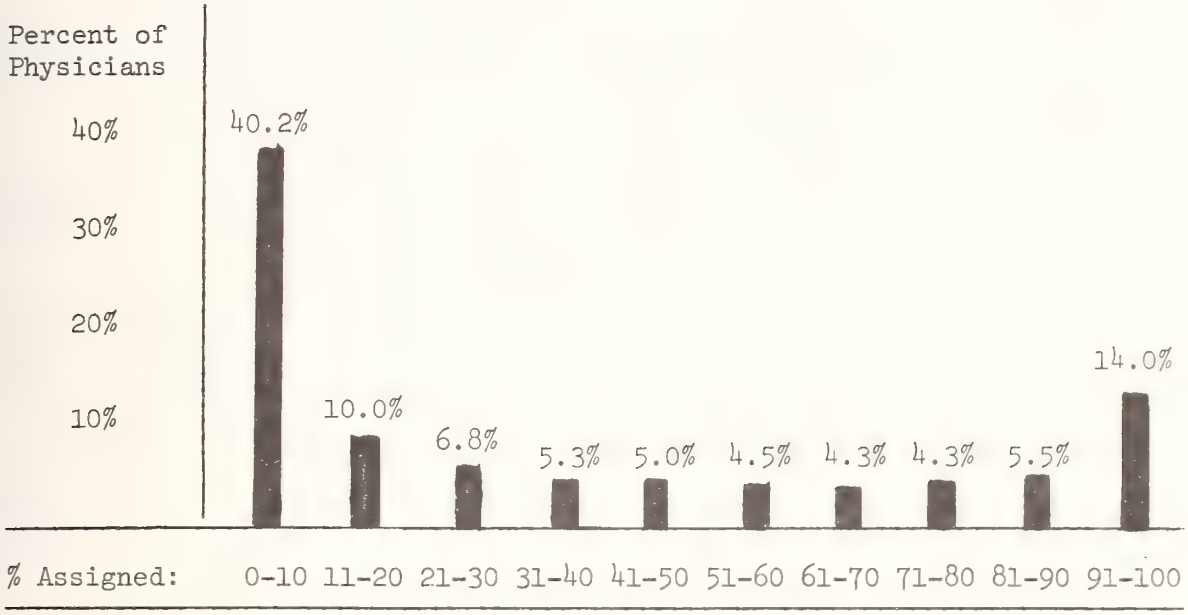
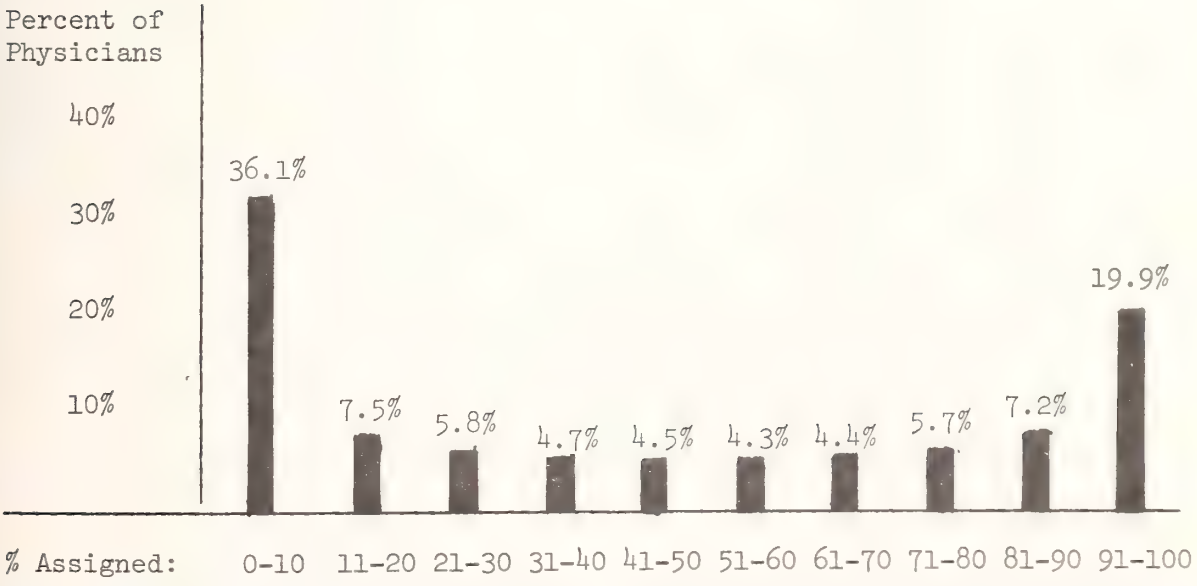


FIGURE 1(b). Percentages of Physicians Taking Assignment on Given Percentages of Medicare Billings



to exhibit claim-by-claim discrimination in their assignment decision process. Even if the relatively indeterminate zone in the middle of the distribution is extended to span a full 40 percent in the middle of the possible response range, it still contains only 19.1 percent of the physicians. Clearly, most physicians have solidly crystallized attitudes, with little or no indecision on the assignment question.

The average assignment rates of 37.7 percent for line items, and 45.1 percent for billed charges, are considerably smaller than the figures one ordinarily sees published for Medicare assignment rates. Pennsylvania Blue Shield, as the Medicare Part B carrier for the state of Pennsylvania, has for many years been reporting claims assignment rates in the neighborhood of 65 percent and more. Official PBS and HCFA figures also consistently state that more than 70 percent of the Medicare dollar volume in Pennsylvania is taken on assignment. While this seems to present an uncomforatable discrepancy between the officially reported figures and the much smaller figures determined in this study, the apparent discrepancy is not hard to reconcile. The 60 and 70 percent figures represent the aggregate proportion of all Medicare claims or dollars on which assignment is taken. This study's figures in the 30 and 40 percent range represent the averages of assignment rates for all of the individual doctors included in the study. It says, in other words, that a "typical" physician in the state of Pennsylvania takes assignment on approximately 37.7 percent of his reported line items; and this probably is a reasonably accurate estimation. What this study also reveals, as will be demonstrated in some of the statistics to be presented later, is that those individual physicians with very high Medicare volumes also tend to

have higher than average individual assignment rates. Thus, a relatively small proportion of physicians contribute a relatively large proportion of assigned claims (or line items) and assigned Medicare dollars. A relatively much larger proportion of physicians, on the other hand, have comparatively low Medicare volumes and relatively low individual assignment rates. It is this large number of physicians with low assignment rates, who also happen to have low Medicare volumes, that manages to bring down the average assignment rate when it is calculated on an individual physician basis, but who -- because of their low volume -- have little impact on aggregate assignment statistics.

A. ASSIGNMENT RATE VARIATION BY GENERAL PHYSICIAN CHARACTERISTICS

This subsection examines the variation in physicians' Medicare assignment rates by selected individual physician characteristics. In all cases, unless otherwise specified, the analysis focuses upon assignment acceptance rate for claim line items. The justification and rationale for taking the line item as the basic unit of measurement of assignment rates has previously been discussed. Essentially, the use of the line item as the basic unit of analysis is necessitated by the fact that original whole claims cannot readily be reconstructed from the computerized transaction history files remaining as a by-product of the claims processing and payment operation (and used as a primary data source for the study data base). In this circumstance, the "line item" is the best available proxy for a "claim," which would be the natural unit of analysis.

Table 4-3 shows comparative assignment rates by a number of nominal characteristics which may be used as physician descriptors. Looking first at a breakdown by broad generic specialty groupings, it can be seen that the lowest average assignment rate is that of the physician in general practice (which for purposes of this analysis also includes family practice). These generalists have an average assignment rate of 27.5 percent. Specialists classed as "other" (anesthesiologists, radiologists, pathologists, etc.) have the highest assignment rate at 51.0 percent. Medical specialists and surgical specialists have rates very similar to one another, at 42.4 and 42.9 percent, respectively.

Providing further depth to these figures, it also can be seen that only 6.7 percent of physicians in general/family practice take assignment consistently (i.e., take assignment on more than 90 percent of the line items reported on their claims), compared to a high of 28.0 percent of physicians in "other" specialties. Conversely, as might be expected from these findings, general/family practitioners also have the greatest proportion (45.6 percent) consistently declining assignment (defined as an assignment rate of 10 percent or less).

The table also shows mean assignment rates and proportions of physicians consistently accepting or declining assignment, for some selected specific major specialties. General surgeons are seen to have relatively high rates of assignment acceptance. Although not explicitly shown in the table display, specialties having the highest assignment rates are nephrology (86.2 percent), physicial medicine-rehabilitation (76.4 percent), and medical oncology (67.2 percent). The lowest rates are for ophthal-otolaryngorinology (EENT -- 10.3 percent), allergy (13.8

TABLE 4-3. MEDICARE ASSIGNMENT BY SELECTED PHYSICIAN CHARACTERISTICS

Variable/Breakdown	Mean LI Assignment Rate	Percent Taking Assignment on: More than 90%	10% or less	C.V.	N
Specialty Group:					
General/Family Practice	27.5%	6.7%	45.6%	1.131	3,279
Medical Specialties	42.4%	17.1%	42.4%	.887	2,304
Surgical Specialties	42.9%	16.8%	33.7%	.854	3,025
Other Specialties	51.0%	28.0%	33.3%	.778	494
Selected Specific Specialties:					
General Practice	27.3%	6.9%	46.3%	1.148	2,488
Family Practice	28.2%	6.1%	43.5%	1.080	791
General Surgery	57.7%	27.4%	21.0%	.619	891
Internal Medicine	41.2%	16.7%	34.4%	.883	1,343
Obstetrics-Gynecology	33.7%	7.3%	40.4%	.963	602
Pediatrics	25.7%	4.7%	91.4%	1.533	90
Physician Degree:					
M.D.	37.3%	13.5%	40.7%	.960	8,019
D.O.	40.0%	18.0%	36.1%	.937	1,083
Board Certification:					
Yes	42.0%	16.9%	38.6%	.885	3,731
No	34.7%	11.9%	41.4%	1.009	5,371
AMA or AOA Membership:					
Yes	35.8%	12.3%	40.4%	.978	7,123
No	44.2%	19.8%	39.5%	.875	1,979
Number of Physician Associates:					
None (solo)	37.3%	13.3%	39.2%	.950	7,742
1-3	26.5%	10.9%	61.2%	1.358	601
4-14	46.6%	23.4%	36.5%	.847	325
15 or more	52.1%	24.0%	31.7%	.724	434

TABLE 4-3. MEDICARE ASSIGNMENT BY SELECTED PHYSICIAN CHARACTERISTICS (continued)

Variable/Breakdown	Mean LI Assignment Rate	Percent Taking Assignment on: More than 90%	10% or less	C.V.	N
Medical Education:					
Pennsylvania Medical School	34.5%	12.0%	42.6%	1.015	6,290
Other U.S. School	39.4%	14.7%	38.5%	.919	1,932
FMG	55.5%	26.3%	27.2%	.657	880
Physician's Age (by Deciles):					
(1) Age 35 or less	58.0%	29.8%	27.5%	.651	---
(2) 36-40	49.2%	21.7%	34.7%	.779	---
(3) 41-44	45.8%	20.8%	35.5%	.821	---
(4) 45-48	40.5%	15.1%	36.2%	.889	---
(5) 49-51	35.1%	12.3%	40.8%	.990	---
(6) 52-55	36.7%	11.6%	40.1%	.956	---
(7) 56-59	34.1%	9.4%	41.3%	.988	---
(8) 60-63	30.0%	8.1%	44.5%	1.074	---
(9) 64-68	28.3%	7.3%	45.8%	1.118	---
(10) 69 or older	22.0%	4.2%	54.7%	1.296	---

percent), gynecology (20.0 percent), and ophthalmology (20.3 percent). It may be noted that those specialties with the highest assignment rates may be expected to encounter a relatively high proportion of elderly patients.

The coefficient of variation (C.V.) provides a measure of the relative concentration or dispersion of the assignment rates for individual physicians included in a cohort. A low C.V. indicates that the physicians as a group are relatively consistent and homogeneous with respect to their assignment acceptance rates; a high C.V., on the other hand, indicates a high degree of variation and broad dispersion in the individual assignment rates for physicians in such a cohort. The data in the table show, for instance, that general practitioners and pediatricians exhibit highly disparate behavior in their assignment decisions, while general surgeons may be noted to be relatively much more similar to one another in their assignment decisions. It is most interesting to note that, in general, there is an inverse relationship between assignment rate and C.V. Physicians in cohorts with high assignment rates seem to be relatively uniform in their apparent preference to take assignment with some consistency. Cohorts with low assignment rates tend to show much less agreement between individual physicians with respect to their assignment acceptance.

In general, the findings show considerable assignment rate variation between specialties. This is evident to some extent even at the level of broad generic classes of specialties (e.g., general versus surgical specialties), but is most pronounced between different specific specialties. Analysis of variance (ANOVA) shows that the breakdown by broad specialty classification accounts for 4.7 percent of the variance in

assignment rates. Specific specialty accounts for fully 14.5 percent of the variance.

D.O. physicians have assignment rates that are marginally higher than those for M.D. physicians; and physicians who are AMA or AOA members have lower average assignment rates. These two variables each explain less than one percent of the variance in individual assignment rates, and thus would appear to have very little influence on the assignment decision.

Board certified physicians show higher average rates of assignment, and more internal consistency (lower C.V.) in their assignment behavior as a group, when compared to physicians who do not have board certification credentials. The overall average assignment rate for board certified physicians was found to be 42.0 percent, compared to 34.7 percent for those without board certification. When one looks at board certification status and broad specialty classification simultaneously -- in effect controlling for specialty class -- the results become mixed. Board certified physicians again appear as those having higher average assignment rates among the generalists and medical specialists, but have lower rates among surgical and other specialties. This is shown in Table 4-4. In any event, ANOVA shows board certification status to account for a mere one percent of the variance in individual physician assignment rates.

Solo practitioners (those indicated as having no physician associates) have an average assignment rate of 37.3 percent. Physicians practicing in very small groups or partnerships have a lower rate (26.5 percent); but those in medium to large sized groups have notably higher average rates. Those with between four and fourteen associates have an

TABLE 4-4. MEAN PERCENT OF LINE ITEMS ASSIGNED, BY SPECIALTY GROUP AND BOARD CERTIFICATION

	General Practice	Medical Specialties	Surgical Specialties	Other Specialties
Board Certified	30.2%	45.0%	41.0%	50.3%
Not Board Certified	27.2%	40.1%	46.5%	52.2%

TABLE 4-5. MEAN PERCENT OF LINE ITEMS ASSIGNED, BY SPECIALTY GROUP AND NUMBER OF ASSOCIATES

	General Practice	Medical Specialties	Surgical Specialties	Other Specialties
No Associates	27.5%	42.1%	43.6%	51.3%
1-3 Associates	19.1%	27.8%	27.7%	39.4%
4-14 Associates	37.8%	42.5%	54.4%	56.9%
15 or more Associates	44.8%	55.9%	47.2%	57.8%

average rate of 52.1 percent. The tendency for more assignment acceptance in larger groups is clear. Table 4-5 shows these effects continuing to hold more-or-less true when controlling for broad specialty class. Number of physician associates, when treated in terms of the four intervals defined for Table 4-5, accounts for 1.6 percent of the variance in assignment rate.

Graduates of medical schools located in the state of Pennsylvania have an average assignment rate of 34.5 percent. Those from medical schools located in other parts of the United States have a slightly higher rate, at an average of 39.4 percent. Foreign medical graduates have the highest rate, 55.5 percent. This is consistent with previous findings by others, and is consistent with the expectation from theory.

The decile breakdown by physician's age in Table 4-3 shows a marked and very well defined tendency for younger physicians to have higher rates of assignment acceptance, and for older physicians conversely to have lower rates. The distribution of average assignment rates proceeds very evenly and uniformly from a high of 58.0 percent average assignment for the youngest ten percent of physicians (aged 35 or younger), to a low of 22.0 percent average assignment for the oldest ten percent (aged 69 or older). This is distinctly in opposition to the anticipated result suggested by theory earlier, in Section II.A.2 of this report. It is, however, consistent with the findings of Paringer (1980). Yett et al. (1981) found mixed results on the effects of the physician's age variable. As noted earlier, the results by physician's age decile once again show a well defined inverse relationship between average assignment rate and internal consistency of assignment behavior (C.V.) for the

physician groups defined by age decile. The youngest physicians, while having the highest average assignment rate, also exhibit the most consistent and well focused assignment behavior as a group. The oldest physicians, with the lowest average assignment rate, show the most disparate group behavior. On the whole, physician's age emerges as a relatively significant factor, accounting for 7.7 percent of the variance in assignment rates.

B. ANALYSIS BY PRACTICE CHARACTERISTICS

For purposes of further in-depth analysis in this study, attention is focused upon comparative characteristics of three distinctly different cohorts of physicians, exhibiting three different extremes of assignment behavior. These are: (1) physicians who consistently take assignment, defined as those having more than 90 percent of their Medicare line items assigned; (2) physicians who consistently decline or refuse assignment, defined as those having 10 percent or less of their Medicare line items assigned; and (3) those who exhibit the most indeterminate and unpredictable behavior, possibly discriminating on a claim-by-claim basis, with almost equal a priori likelihood of accepting or rejecting assignment. This last group is defined to contain the 19.5 percent of physicians having assignment rates in the range of 31 to 70 percent -- i.e., the "indecisive middle" of the assignment distribution. To deliberately exaggerate these three extreme modes of behavior, and to enhance the differences between them, physicians in the "grey areas" (assigning 11-30 percent and 71-90 percent) are ignored.

Three different sets of variables were established, as previously outlined and discussed in Sections III.B.3 and III.B.4 of this report, containing factors to describe the physician's practice with Medicare patients, his overall practice (here defined as only Medicare and Blue Shield patients), and his practice locale (at the county level). The means of these variables were calculated for each of the three distinct cohorts of physicians defined above, and analysis of variance (ANOVA) was used to determine the extent to which the variance in each descriptor variable is explained by the partitioning of the physician population into the three extreme assignment behavior classes.

ANOVA results for each of the three sets of variables are presented and discussed below.

1. Medicare Practice Characteristics

Table 4-6 displays the group means of nine key variables that may be used to describe a physician's Medicare practice, for groups of physicians exhibiting three distinctly different modes of assignment behavior, as described above. All of the factors are statistically significant. The apparent association between each of these factors and physicians' responses to the assignment option may be summarized as follows:

(a) Assignment rate is directly related to the size of the physician's Medicare patient roster. In particular, physicians with relatively small Medicare patient rosters show a marked tendency to refuse assignment consistently.

TABLE 4-6. MEDICARE PRACTICE CHARACTERISTICS, BY MEDICARE ASSIGNMENT RATE

	Mean Value for Physicians Taking Assignment on:			
	10% or less Line Items	31-70% of Line Items	More than 90% of Line Items	Eta Squared
Number of Different Medicare Patients Seen	79.9	144.2	148.9	.0641
Percent of Patients Medicare	59.4%	57.6%	54.5%	.0031
Annual Number of Medicare Services	734	1,170	1,310	.0347
Total Annual Medicare Billings	$9,514	$19,193	$29,658	.1207
Medicare Allowed/Billed Charge Ratio	.867	.861	.830	.0258
Mean Charge per Medicare Service	$16.89	$27.14	$47.20	.0826
Mean Annual Services per Medicare Patient	7.88	8.18	8.37	.0010
Mean Annual Billing per Medicare Patient	$89.57	$130.89	$203.23	.1965
Medicare Relative Price Index	97.0	99.3	113.8	.0472

(b) There is a mild tendency for physicians with relatively larger proportions of Medicare patients in their overall patient mix to take less assignment.

(c) Physicians delivering larger numbers of services in their Medicare practice accept more on assignment.

(d) Physicians with larger total annual Medicare billings take more on assignment.

(e) Proportionately larger cut-backs from billed to allowed charge do not have the expected negative impact on assignment acceptance. On the contrary, greater assignment rates are correlated with smaller proportions of billed charges allowed -- i.e., with larger cut-backs. This is contrary to popular intuition and theory.

(f) Physicians dealing in larger-valued types of services in their Medicare practices take more on assignment.

(g) There is a mild -- almost negligible -- tendency for physicians exhibiting a higher intensity of services per patient in their Medicare practice to take more assignment.

(h) Physicians with larger annual billings per Medicare patient are strongly disposed to take more assignment.

(i) Physicians who are relatively high-priced (as Medicare providers) take more assignment.

The eta squared statistic is a measure of the proportion of variance in the distribution of the descriptor variable that is explained by the assignment behavior classes. The values shown in Table 4-6

indicate a rather strong relationship of assignment rate to mean annual billing per Medicare patient (19.7 percent of variance explained), and to the physician's annual total Medicare billing (12.1 percent of variance explained). There also is indicated a moderate relationship to mean charge per Medicare service, which serves an an indicator of whether the physician deals in relatively larger-valued or smaller-valued services, and to the size of the physician's Medicare patient roster. These have, respectively, 8.3 percent and 6.4 percent of variance explained. The small eta squared values for percent of patients Medicare and for mean annual services per Medicare patient suggest that these factors are of little consequence relative to Medicare assignment.

In summary, it would appear that the Medicare practice factors of greatest importance to the physician's Medicare assignment decision are mean annual billings, the general value level of the services in which he deals, and the size of his Medicare patient roster, in that order. To assess probable directional effects, the findings suggest that the physician will be more likely to have a larger Medicare assignment rate if he has a larger roster of Medicare patients, if he deals in relatively higher-valued services, and if he has a large Medicare dollar volume.

2. Overall Practice Characteristics

Table 4-7 displays the group means for eight key variables describing a physician's overall practice, for each of the three physician assignment response groups. Again, all of the factors are significant. The relationships of each factor to the assignment response are summarized below:

TABLE 4-7. OVERALL PRACTICE CHARACTERISTICS, BY MEDICARE ASSIGNMENT RATE

	Mean Value for Physicians Taking Assignment on:			
	10% or less Line Items	31-70% of Line Items	More than 90% of Line Items	Eta Squared
Total Number of Different Patients Seen	168.3	293.8	327.2	.0562
Aggregate Annual Number of Services	850	1,641	1,905	.0700
Aggregate Total Annual Billings	$16,497	$36,115	$55,222	.1499
Aggregate Allowed/Billed Charge Ratio	.839	.834	.795	.0266
Aggregate Mean Charge per Service	$28.61	$38.85	$54.60	.0310
Aggregate Mean Annual Services per Patient	6.12	6.51	6.59	.0016
Aggregate Mean Annual Billing per Patient	$94.52	$129.48	$185.67	.1174
Aggregate Price Index	95.2	97.5	111.0	.0467

(a) Physicians with larger overall patient rosters take more on assignment.

(b) Physicians delivering larger overall volumes of services take more on assignment.

(c) Physicians with larger dollar volumes of overall annual billings take more assignment.

(d) Physicians who experience larger proportionate cut-backs in their combined Blue Shield and Medicare practice take more on assignment. Again, this is contrary to popular intuition and theory.

(e) Physicians who deal in higher-valued services take more on assignment.

(f) There is a mild tendency for physicians who have relatively high assignment rates to also exhibit a slightly greater intensity of services per patient.

(g) Physicians with higher mean annual billings per patient take more on assignment.

(h) Physicians with generally higher prices take more on assignment.

The eta square statistics indicate a strong relationship of assignment rate to total annual billings (15.0 percent of variance explained), and to the average annual billing per patient (11.7 percent of variance explained). A more modest, but still meaningful, relationship exists for total volume of services delivered (7.0 percent explained) and

for the size of the combined Blue Shield and Medicare patient roster (5.6 percent explained). These factors, in the order identified, would appear to be the overall practice characteristics of greatest importance in the physician's assignment decisions. Essentially paralleling the findings for Medicare practice characteristics, a physician is more likely to have a larger Medicare assignment rate if he has a large dollar volume in his practice and if he has a relatively large patient roster.

Comparing the findings for overall practice with the findings for the Medicare component of a physician's practice, it is interesting to note that the annual dollar volume in the overall practice appears to be a more important factor than relative dollar volume in Medicare alone. On the other hand, the average annual billing per Medicare patient dominates the mean annual billing per patient in the overall practice. It also appears that the relative size of the Medicare patient roster is slightly more important to the assignment decision than is the relative size of the overall patient roster.

3. Average Fee Levels Assigned and Unassigned

In general, assigned services or line items have higher average billed charges than their unassigned counterparts. Overall, the mean billed charge per assigned line item is $54.75; for unassigned line items, the mean billed charge is $25.24. This general relationship between average billed charges for assigned and unassigned line items holds through all stratifications and breakdowns of the physician population. By broad specialty class, for instance, generalists average $19.74 per assigned line item and $11.07 per unassigned line item;

medical specialists average $34.45 assigned and $18.57 unassigned; surgical specialists average $105.08 assigned and $43.66 unassigned; and other specialists average $52.52 assigned and $39.06 unassigned. This dominance of the assigned over the unassigned average charge per line item continues for breakdowns by board certification, medical school, number of physician associates, and all other nominal physician descriptors used in this study. One final specific comparison might be of interest: Physicians with assignment rates of 10 percent or less have a $50.99 average billed charge per assigned line item, and an average billed charge of $20.11 per unassigned line item. Physicians with assignment rates of better than 90 percent average $67.38 per assigned line item and $41.55 per unassigned line item. The average billed charge, whether assigned or unassigned, is consistently larger for the physician who nearly always takes assignment than it is for the physician who hardly ever takes assignment. Also, the gap between the average assigned and the average unassigned charge is much larger for the physician who consistently declines assignment than for the physician who consistently accepts assignment.

C. ANALYSIS OF CHARACTERISTICS OF PRACTICE LOCALE

Physicians' practice locales for purposes of this study are taken at the county level. There is substantial variation in Medicare assignment acceptance rates by county in Pennsylvania. For counties represented by more than ten physicians in the sample drawn for this study, average assignment rates for individual physicians grouped by county range from

highs of 61.8 percent for Susquehanna County and 61.0 percent for Vanango County, to lows of 14.8 percent for York County and 18.8 for Berks County. The general tendency is for the several counties with the highest averages of individual physicians' assignment rates to be located in the state's sparsely populated, wooded, and mountainous northern tier. The counties with the lowest average assignment rates are those associated with some of the state's more prosperous lesser metropolitan areas -- counties containing the cities of York, Reading, Lancaster, Harrisburg, and the Allentown-Bethlehem-Easton metropolitan area. Philadelphia physicians have an average assignment rate of 49.3 percent; and the four counties comprising suburban Philadelphia have an average 34.4 percent assignment rate. Allegheny County, containing the City of Pittsburgh, has a 40.1 percent average assignment rate. As noted earlier, the coefficients of variation (C.V.) calculated for each county indicate that those places with the highest average assignment rates also have the tightest concentrations of individual physicians' assignment rates -- i.e., relatively well-focused and homogenous physician response to the assignment option. Places with the lowest average assignment rates have the greatest dispersion of individual physicians' assignment rates. Overall, the breakdown by counties accounts for 7.9 percent of the variance in physicians' rates of assignment.

Following is a more detailed examination of some specific locality variables in relation to physician behavior under the Medicare assignment option. As in the earlier analysis by physician practice characteristics, attention is focused upon the comparative characteristics of three cohorts of physicians exhibiting different extremes of assignment behavior:

(1) those who consistently take assignment; (2) those who consistently decline assignment; and (3) those whose behavior is the most inconclusive and unpredictable, possibly discriminating on a claim-by-claim basis. The operational definitions for these three classes of physicians are as before: (1) physicians taking assignment on more than 90 percent of line items; (2) physicians taking assignment on 10 percent or less of line items; and (3) those with assignment rates in the 31 to 70 percent range.

The locality (county) variables are as outlined previously in Section III.B.4. They include three subclasses of variables: (1) general demographic and socioeconomic factors; (2) factors relating to the medical service economy -- factors which in economic terms would be thought of as cost and supply variables; and (3) factors describing health care insurance and subsidization in the medical services marketplace. As before, the means of these variables are calculated for physicians in each of the three assignment response classes, and ANOVA is used to determine whether the group means are significantly different, and to determine the extent to which the variance in each locality variable is explained by the breakdown into assignment response classes.

1. General Demographic and Socioeconomic Factors

Group means for all of the locality variables are displayed in Table 4-8. The data are circa 1975. Variables contained in the first block in this table are the demographic and socioeconomic factors. All of them are significant. Their observable apparent associations with physicians' assignment rates are summarized below:

TABLE 4-8. COMPARATIVE CHARACTERISTICS OF PHYSICIANS' PRACTICE LOCALES (COUNTY LEVEL), BY MEDICARE ASSIGNMENT RATE

	Mean Value for Physicians Assigning: ≤ 10% Line Items	31-70% Line Items	> 90% Line Items	Eta Squared
General Demographic/Socioeconomic:				
Population density	3,394	3,774	6,236	.0367
Per capita income	$3,227	$3,093	$3,167	.0126
Median years education	11.70	11.66	11.54	.0103
Percent college graduates	9.43%	8.71%	8.88%	.0076
Percent laborers in workforce	4.66%	4.89%	4.75%	.0081
Percent workforce unemployed	5.41%	5.89%	6.04%	.0500
Pct. families below poverty level	7.33%	8.13%	8.67%	.0312
Percent voted conservative	48.70%	46.94%	43.75%	.0349
Consumer price index	116.2	116.0	117.7	.0204
Medical Service Economy:				
Relative price index for physicians' Medicare services	98.1	97.6	101.7	.0210
Mean monthly office payroll	$4,810	$4,763	$4,901	.0021
Mean monthly pay per employee	$1,301	$1,303	$1,343	.0055
Number of general hospital beds	4,153	4,454	6,650	.0387
Hospital beds per 100,000	461.2	486.6	535.6	.0222
No. direct patient care physicians	924	925	1,306	.0326
Number of primary care physicians	405	415	605	.0380
DPC physicians per 100,000	117.27	109.58	115.24	.0070
PC physicians per 100,000	51.35	49.02	51.87	.0080
Insurance and Subsidization:				
Blue Shield enrollment	500,976	528,029	782,770	.0348
Blue Shield penetration	53.63%	53.31%	59.23%	.0100
Pct. physicians Blue Shield par.	81.7%	83.2%	83.6%	.0172
Blue Shield payments ($ millions)	$15.469M	$15.731M	$22.551M	.0310
Pct. Medicare line items assigned	45.6%	49.4%	54.1%	.0545
Medicare allowed charges ($ mil.)	$22.154M	$23.561M	$36.372M	.0395
Per cap. state med. exp.	$64.08	$65.32	$81.03	.0290

(a) Assignment rates are higher in places with higher population density. This seems to be at odds with the earlier observation that the counties with the highest average assignment rates are in the sparsely populated northern tier. These northern tier counties, on the other hand, also tend to have relatively few physicians. It is likely that in these statistical calculations they are dominated by the large number of physicians in Philadelphia, for instance, who also have relatively high assignment rates.

(b) The influence of per capita income is mixed and unclear.

(c) Population education, as measured by median years of schooling, shows a weak relationship indicating lower rates of assignment where there is relatively higher educational attainment.

(d) Higher education, measured by the percentage of population who have four or more years of college, shows no clear effect. To the extent that anything is discernable, it may be suggested that places with greater proportions of college graduates tend to have less assignment acceptance.

(e) The general quality and nature of the locality's workforce, as indicated by the percentage of laborers in the workforce, shows very little variation and very little effect. What effect there may be is mixed and unclear.

(f) There seems to be a clear tendency for assignment rates to be higher where there are higher rates of unemployment.

This may suggest a service or charity motive on the part of many physicians. Or physicians in such an area may be more prone to accept assignment simply to assure that they get paid.

(g) Physician assignment rates are somewhat higher where there are relatively more families below the poverty level, and are lower where there are fewer families below the poverty level.

(h) There is a clear, although modest, tendency for assignment rates to be lower where the local population base has a politically more conservative orientation. Conversely, this also suggests higher assignment rates at places where there is a more liberal orientation.

(i) There is a weak tendency for higher assignment rates at places where the cost of living is higher.

None of these factors is very strong. The eta squared statistic indicates that unemployment, with 5.0 percent of variance explained, is the most influential factor in this group. Other factors with at least slight influence would be population density, political orientation (liberal-conservative), and the proportion of families below the poverty level. None would appear to be very strong determinants in the assignment decision, however, each having barely more than three percent of their variance accounted for.

With respect to this subset of locality variables, it may be suggested that assignment rates tend to be higher in urbanized locales

where there is a slightly greater presence of political liberalism, and where physicians face populations having relatively greater unemployment and poverty levels.

2. Medical Services Economy

These factors, with group means displayed in the middle block in Table 4-8, generally would be considered cost and supply factors. All of these factors are significant. Observations on these variables are summarized as follows:

(a) There appears to be a tendency for high assignment rates at places where there are a greater number of high-priced physicians. Beyond this, there is no clear definition to the effect of the price level factor.

(b) Physicians' office expenses, as measured by the mean monthly payroll in physicians' offices, exhibit very little variation. This factor has no clear practical effect.

(c) Physicians' office expenses, measured by the mean monthly pay per employee in physicians' offices, also shows very slight variation. The factor's effect is in a direction indicating higher assignment rates corresponding to higher office wages. The effect, however, appears to be very weak.

(d) Higher rates of assignment are associated with places where there are greater numbers of hospital beds available.

(e) Higher assignment rates also are associated with higher

levels of hospital bed supply when measured in relation to the locality's population base.

(f) Assignment rates are high where there are relatively large numbers of physicians. For localities with smaller numbers of physicians, it is difficult to differentiate between an indeterminate reponse and a low assignment rate response. These observations hold whether measured in terms of primary care physicians or in terms of direct patient care physicians. The relationship is slightly more well-ordered for the primary care physician supply factor.

(g) When physician supply is measured relative to the local population base, the relationship to physician assignment rates is not entirely clear. The data seem to suggest a U-shaped function to describe physician assignment response as a function of physician-to-population ratio, whether expressed in terms of primary care physician supply or supply of all direct patient care physicians. The U-shape function suggests that, where there is a high level of physician supply relative to population, there is a more definitive response (one way or the other) to the assignment option. This then also implies that, where the physician supply relative to population is smaller, physicians would be more prone to discriminate on a claim-by-claim basis in the assignment decision.

All of these factors are relatively weak. The strongest appear to be the hospital bed count and the physician counts; but even in these, hardly more than three percent of the variance is accounted for. It is interesting to note that the hospital bed and physician supply variables measured in terms of absolute numbers show a stronger relationship than the analogous supply variables measured relative to the population base. Also, physician supply measured in terms of primary care physicians shows a stronger response than physician supply measured in terms of all direct patient care physicians.

In this subset of locality variables, the results may be summarized as suggesting that hospital bed supply and physician supply (measured in terms of absolute numbers) have some modest influence on assignment rates, with assignment rates tending to be higher where supplies are greater.

3. Health Care Insurance and Subsidization Factors

Group means for these variables are displayed in the lower block of Table 4-8. In economic analysis terms, these would principally be considered demand variables. All of them are significant. These variables show relationships as summarized below:

(a) Medicare assignment rates increase directly with increases in Blue Shield enrollment.

(b) Using Blue Shield penetration relative to the locality population base as a measure of Blue Shield presence in the market, there is little or no discrimination between a

negative response and an indeterminate response on Medicare assignment. High assignment rate, however, is associated with relatively high Blue Shield population penetration. On the whole, this is a weak variable.

(c) Medicare assignment increases slightly in association with increases in physician Blue Shield participation by locality. The effect is weak, however.

(d) High levels of Blue Shield payments in a locality are associated with high levels of assignment acceptance. The discrimination between low and indeterminate assignment responses, however, is weak.

(e) Individual physician assignment rate is shown to have a well-ordered and moderately strong relationship to the average percentage of line items assigned by all doctors in a locality. This relation may suggest that the individual physician is more inclined to accept assignment in localities where his physician colleagues have a high aggregate assignment rate.

(f) Higher assignment rates are associated with localities having higher total Medicare charges allowed.

(g) Greater amounts of state money going to a locality for medical programs are associated with higher assignment rates.

The eta squared statistics show the most influential variable from this group to be the percent of Medicare line items taken on

assignment in the locality. The assignment response classes account for 5.5 percent of the variation in this factor. Somewhat more modestly related, with approximately three percent of variation explained for each, are Blue Shield enrollment, total Blue Shield payments, and total Medicare allowed charges.

These results tend to confirm, as suggested by theory, that assignment rates will be higher where there is more money getting into the market from private insurance programs and from government. The results also suggest, as discussed above, that physicians may tend to follow their local colleagues in making the assignment decision.

V. FINDINGS: BLUE SHIELD PARTICIPATION

For the 9,827 physicians represented in the project data base, the overall rate of Blue Shield participation was 87.5 percent. Company records maintained by Pennsylvania Blue Shield indicate that, over the past several years, the proportion of doctors listed in the PBS provider masterfile as participating has hovered around the 80 percent level. The 87.5 percent participation rate determined from the project data base is reasonably consistent with the approximately 80 percent participation suggested over the long term by company records. This follows from the facts that: (1) the company provider masterfile contains roughly twice as many physicians as are represented in the project data base; (2) the physicians represented in the project data base were selected specifically because they have at least minimally significant volumes of Blue Shield claims experience, whereas many of the remainder of the physicians listed in the PBS physician masterfile hardly ever submit a Blue Shield claim; and (3) there is an *a priori* perception that physicians who rarely, if ever, submit claims to Blue Shield do not tend to participate. Among physicians who regularly submit claims to Blue Shield, 87.5 percent probably is a reasonably accurate estimate of the participation rate. PBS company records for a number of recent years also show a relatively stable long-term figure in the neighborhood of 85 percent for the proportion of Blue Shield payment dollars going to participating physicians.

A. PARTICIPATION BY GENERAL PHYSICIAN CHARACTERISTICS

Physician participation with Blue Shield is an all-or-nothing proposition. As previously discussed in Section I.A., a participating physician in effect "takes assignment" on all of his Blue Shield claims; a nonparticipating physician takes assignment on none of his Blue Shield claims. Thus, in measuring and studying Blue Shield participation, there is nothing analogous to the "assignment rate" calculated at the individual physician level for Medicare. The term "participation rate" has meaning only in relation to a population or given cohort of physicians, in which sense it then describes the relative proportion or percentage of physicians in the population or cohort who are participating. Table 4-9 shows the comparative participation rates for cohorts of physicians defined by breaking down a number of nominal characteristics used as physician descriptors. Eta squared statistics also were calculated for each nominal variable in the series of cross-tabulation analyses with the physician participation status variable. The eta squared value provides a measure of the proportion of population variance in physician participation that is explained by the breakdown on a given nominal physician characteristic factor.

It can be seen from Table 4-9 that generalists (general practice and family practice physicians) have the highest participation rate. Of the 3,370 general physicians represented in the data base, 92.6 percent are participating. As a group, surgical specialists have the lowest rate, with 81.9 percent of the represented 3,189 surgical specialists

TABLE 4-9. BLUE SHIELD PARTICIPATION, BY GENERAL PHYSICIAN CHARACTERISTICS

Variable/Breakdown	% Par.	N
Specialty Group:		
General Practice	92.6%	3,370
Medical Specialties	88.6%	2,733
Surgical Specialties	81.9%	3,189
Other Specialties	83.2%	535
Selected Specific Specialties:		
General Practice	93.5%	2,547
Family Practice	89.7%	823
General Surgery	88.3%	935
Internal Medicine	88.3%	1,414
Obstetrics-Gynecology	82.8%	646
Pediatrics	93.1%	360
Physician Degree:		
M.D.	86.6%	8.720
D.O.	94.9%	1,107
Board Certification:		
Yes	83.4%	4,155
No	90.5%	6,572
AMA or AOA Membership:		
Yes	87.9%	7,600
No	86.1%	2,227
Number of Physician Associates:		
None	86.8%	8,340
1-3	90.3%	649
4-14	95.3%	342
15 or more	90.5%	496
Medical Education:		
Pennsylvania Medical School	87.3%	6,720
Other U.S. Schools	86.5%	2,114
FMG	90.9%	993
Physician's Age Decile:		
(1) Age 35 or less	85.7%	----
(2) 36-40	85.6%	----
(3) 41-44	85.2%	----
(4) 45-48	86.0%	----
(5) 49-51	86.6%	----
(6) 52-55	87.8%	----
(7) 56-59	88.4%	----
(8) 60-63	90.2%	----
(9) 64-68	90.3%	----
(10) 69 or older	89.4%	----

participating. The four broad specialty classes account for 1.9 percent of the variance in participation status.

Among the selected specific major specialties displayed in the table, the primary care specialties -- general practice, family practice, and pediatrics -- are seen to exhibit the highest participation rates, ranging from 89.7 percent to 93.5 percent. General surgeons and internists both have rates that are marginally higher than the overall population rate. Among all specialties, including those not explicitly shown in the table, the highest participation rates (in addition to those already shown for primary care physicians) are those for specialists in roentgenology-radiology (96.6 percent) and physical medicine-rehabilitation (96.5 percent). The lowest participation rates are for specialists in ophthalmology (72.1 percent), plastic surgery (71.8 percent), gynecology (69.4 percent), and anesthesiology (63.2 percent). Specific specialty accounts for 4.1 percent of the variance in participation status.

Participation rates for M.D. and D.O. physicians are 86.6 percent and 94.9 percent, respectively. D.O. physicians, however, constitute only 11.3 percent of the physician population in the study. It may be noted that the high rate of participation for osteopaths is consistent with the fact that they are heavily concentrated in general practice, which also has a high rate of participation.

Results for factors commonly perceived as being associated with physician quality confirm the theoretically expected result of higher participation rates for lower quality physicians. The above discussion already has indicated that specialty credentials are associated with lower participation. Board certification credentials similarly are associated

with lower participation; boarded and non-boarded physicians have respective participation rates of 83.4 percent and 90.5 percent. FMG physicians, sometimes suspected of having lower quality training (and thus of delivering lower quality services), have a higher-than-average participation rate of 90.9 percent. FMGs, incidentally, tend to be specialists; they are not concentrated in general practice. Thus, the high participation for FMGs cannot be explained by any association of FMGs with the high-participation general practice cohort. Even though these presumed quality-related effects are working in the theoretically correct direction, they appear to have only weak influence. Board certification accounts for 1.1 percent of the variation in participation; and the three-way breakdown by source of medical education accounts for a nearly negligible 0.1 percent.

There is comparatively little difference in participation rates between physicians who are, and those who are not, members of their national professional associations (AMA or AOA). The eta squared for this factor is negligible.

Physicians practicing in association with other physicians have higher participation, particularly those involved with medium-sized groups (4 to 14 associates). All three of the non-solo cohorts have participation rates exceeding 90 percent, with a high of 95.3 percent for the medium-group cohort. This factor accounts for only 0.3 percent of the participation variance, however.

The distribution by physicians' age deciles shows a very clear tendency for participation to be higher among older physicians, and lower among younger physicians. The youngest 10 percent of physicians have an

85.7 percent participation rate; and the oldest deciles have rates in the neighborhood of 90 percent. The increasing progression in participation rate from the youngest decile to the oldest is almost perfectly monotonic, and supports the theory suggested in Section II.A.2. In spite of the apparent orderliness of the relation between physician's age and participation status, the age breakdown explains only a modest 2.8 percent of the variation in participation.

B. ANALYSIS BY PRACTICE CHARACTERISTICS

For further analysis by physicians' practice characteristics, group means on the practice characteristic variables outlined in Section III.B.3 were calculated for participating and nonparticipating physician cohorts. ANOVA was used to determine whether differences in group means on a given variable were significant, and to determine the extent to which variance in each of the descriptor variables may be explained by the separation of the physician population into participating and nonparticipating components.

Two different sets of variables are used in describing a physician's practice characteristics: (1) a group of nine variables describing only the Blue Shield component of the practice; and (2) a group of eight variables describing some key characteristics of the physician's overall practice, encompassing the Blue Shield and Medicare components in aggregate. ANOVA results for each of these sets of variables are presented below.

1. Blue Shield Practice Characteristics

Table 4-10 displays the group means of nine key variables used to describe a physician's Blue Shield practice, for participating and nonparticipating physicians, respectively. The difference in means for annual services per Blue Shield patient is not statistically significant. On the variables for number of patients seen and percent UCR, the difference is significant at the .05 level. All other variables are significant at the .001 level or better. The following is a summary of observations that may be made from the results shown in this table:

(a) Nonparticipating physicians see more Blue Shield patients than participating physicians do. It is suggested that a relatively large Blue Shield patient roster provides no particular incentive for a physician to participate.

(b) The nonparticipating physician also provides a larger volume of services for Blue Shield subscribers than the participating physician does. Again, the physician is not particularly motivated to participate with Blue Shield simply by virtue of delivering a relatively large number of services covered by Blue Shield.

(c) The average total annual billing for Blue Shield services is larger for nonparticipating physicians than for those who participate. Clearly, this is related to -- and perhaps follows from -- the preceding two points. A large dollar volume of services covered by Blue Shield provides no particular motivation to participate.

TABLE 4-10. BLUE SHIELD PRACTICE CHARACTERISTICS, BY BLUE SHIELD PARTICIPATION STATUS

	Mean Value of Characteristic for: Participating Physicians	Nonparticipating Physicians	Eta Squared
Number of Different Blue Shield Patients Seen	125.7	139.2	.0004
Annual Number of Blue Shield Services	448	526	.0012
Total Annual Blue Shield Billings	$16,825	$24,007	.0007
Blue Shield Allowed/Billed Charge Ratio	.789	.763	.0043
Mean Charge per Blue Shield Service	$50.96	$74.66	.0094
Mean Annual Services per Blue Shield Patient	3.36	3.19	.0004
Mean Annual Billing per Blue Shield Patient	$108.89	$145.73	.0106
Percent Blue Shield Services UCR	66.2%	67.9%	.0007
Blue Shield Relative Price Index	95.6	100.1	.0031

(d) Nonparticipating physicians have a smaller proportion of their billed charges allowed -- i.e., their fee cut-backs are proportionately larger than those of participating physicians. This conforms to the popular theory that larger cut-backs may contribute a disincentive to participation.

(e) In the context of Blue Shield practice, the physician who delivers relatively higher-valued services is less likely to be participating; and conversely, the participating physician delivers services that on the average are lower-valued.

(f) The data indicate a slightly greater numerical intensity of services per Blue shield subscriber for participating physicians. The difference, however, is not statistically significant. The conclusion must be that there is no essential difference between participating and nonparticipating physicians with respect to intensity of services for patients covered by Blue Shield.

(g) The mean annual billing per Blue Shield patient is larger for nonparticipating physicians than for participating physicians. This is consistent with, and undoubtedly follows from, points (a), (b), (c), and (e), above.

(h) Nonparticipating physicians have a slightly larger proportion of their services for Blue Shield patients covered under UCR. The difference is statistically

significant, but not as strongly significant as for most other variables.

(i) The nonparticipating physician tends to have higher prices than the participating physician for services covered by Blue Shield.

All of these factors have almost negligible percentages of their variance explained by the difference between participation or nonparticipation in Blue Shield. The greatest proportion of variance explained is for the annual billing per patient variable, and in this case it is only 1.1 percent. For all other variables in this list, it is less -- usually much less -- than one percent.

The differences highlighted in Table 4-10 suggest that large Blue Shield volumes, however measured, do not motivate participation. Results from the factors in this list give little or no insight into what does motivate participation. There is an indication that larger relative cut-backs from billed to allowed charges tend to discourage participation. All of the factors in this list appear to have only weak effects in any case.

2. Overall Practice Characteristics

The group means for eight key variables used to describe a physician's overall practice are displayed in Table 4-11. All of the factors in this list are statistically significant. The variable for aggregate annual number of services is somewhat less significant than the

TABLE 4-11. OVERALL PRACTICE CHARACTERISTICS, BY BLUE SHIELD PARTICIPATION STATUS

	Mean Value of Characteristic for: Participating Physicians	Nonparticipating Physicians	Eta Squared
Total Number of Different Patients Seen	242.5	273.3	.0011
Aggregate Annual Number of Services	1,357	1,227	.0006
Aggregate Total Annual Billings	$30,141	$39,261	.0054
Aggregate Allowed/Billed Charge Ratio	.833	.809	.0065
Aggregate Mean Charge per Service	$35.46	$49.50	.0065
Aggregate Mean Annual Services per Patient	6.51	5.32	.0058
Aggregate Mean Annual Billing per Patient	$121.40	$140.22	.0039
Aggregate Price Index	97.8	104.5	.0067

others, but still is easily significant at the .05 level. The following effects may be observed or inferred from the results shown in this table:

(a) A larger overall patient roster is associated with nonparticipation.

(b) A larger overall volume of services is associated with participation status.

(c) Larger aggregate annual dollar volume in billings is associated with nonparticipation.

(d) Nonparticipating physicians have a relatively smaller proportion of billed charges allowed. It can be inferred from these data that, on the average, nonparticipating physicians are experiencing fee cut-backs relative to their billed charges that are approximately 14 percent larger than those experienced by participating physicians.

(e) Nonparticipating physicians tend to deal in higher-valued services, compared to participating physicians.

(f) Participating physicians have a greater intensity of services per Blue Shield subscriber than nonparticipating physicians do.

(g) Nonparticipating physicians have somewhat larger annual billings per Blue Shield patient than participating physicians do.

(h) Nonparticipating physicians have higher overall price levels--approximately seven percent higher, on the average.

All of these are very weak factors. None of them has as much as one percent of variance accounted for.

The directional effects are mixed. It would appear that participating physicians have a greater volume of services and intensity of services per patient, but that nonparticipating physicians have larger patient volumes and dollar volumes in their overall practice. The nonparticipating physician also appears as a higher priced physician, dealing in higher-valued services. Relatively larger fee cut-backs seem to have a negative impact on participation. Again, however, it must be cautioned that the effects are weak.

C. ANALYSIS BY CHARACTERISTICS OF PRACTICE LOCALE

Practice locales are identified at the county level. Rates of physician participation in Blue Shield exhibit extensive variation by county. They range from a low of 64.4 percent in York County to a high of 100 percent participation in some sparsely populated counties in the mountainous and wooded center and northern tier of the state. Philadelphia County is the median, at 91.9 percent participation. The first and third quartile points are at 84.4 percent and 95.8 percent, respectively. Thus one-fourth of the counties are in a range running from 64.4 percent to 84.4 percent participation; one-fourth run from 84.4 percent to 91.9 percent; one-fourth from 91.9 percent to 95.8 percent; and the top one-fourth from 95.8 percent to 100 percent. There are eight SMSA counties in the first (lowest participation) quartile; eleven SMSA counties in the second quartile; three in the third quartile; and five

in the fourth (highest participation) quartile. From this, there would appear to be a tendency for better participation rates in the less populous, rural counties. Allegheny County (Pittsburgh), incidentally, is in the lowest quartile, with a participation rate of 83.2 percent. Overall, 3.7 percent of the variation in participation status is accounted for by county.

The remainder of this section entertains an examination of specific locality (county) variables that may be hypothesized to have some relation to physicians' participation responses. These variables were outlined earlier, in Section III.B.4, and are the same as those used in the immediately preceding section for an examination of the Medicare assignment response to practice locality factors. In brief, there are three subclasses of variables: (1) general demographic and socioeconomic factors; (2) selected factors relating to the local medical services economy -- essentially, cost and supply variables; and (3) factors describing health care insurance and subsidization in the local medical marketplace. Continuing the analytic strategy employed for other segments of this study, the group means of these variables are calculated for participating and nonparticipating physician cohorts. ANOVA is used to determine whether the group means are significantly different, and to determine the extent to which variance in each locality variable is explained by the participating-nonparticipating breakdown.

1. General Demographic and Socioeconomic Factors

Table 4-12 displays the group means for all of the locality variables. The variables in the first block at the top of this table are the demographic and socioeconomic factors. All of these factors are statistically significant. Effects that may be associated with each variable, relative to Blue Shield participation, are summarized below:

(a) There is a tendency toward greater participation in localities with greater population density. Thinking of population density as a demand factor, the theoretical expectation would be for higher population density to generate more demand and more opportunity for the physician in the private unassigned and nonparticipating market. The expected result would be lower participation, but this is not the result obtained.

(b) Nonparticipation is associated with slightly higher per capita income.

(c) Nonparticipation is associated with slightly higher levels of educational attainment for the population base. There is very little variation in this factor.

(d) Nonparticipation also is associated with higher population achievement in higher education -- i.e, where there are more college graduates, there is less participation.

(e) Where there are proportionately more laborers in the workforce -- i.e., a relatively lower grade workforce -- there is more participation.

TABLE 4-12. COMPARATIVE CHARACTERISTICS OF PHYSICIANS' PRACTICE LOCALES (COUNTY LEVEL), BY BLUE SHIELD PARTICIPATION STATUS

	Mean Value of Characteristic for: Participating Physicians	Nonparticipating Physicians	Eta Squared
General Demographic/Socioeconomic:			
Population density	4,144	2,965	.0048
Per capita income	$3,162	$3,243	.0028
Median years education	11.64	11.75	.0036
Percent college graduates	9.00%	9.62%	.0029
Percent laborers in workforce	4.78%	4.61%	.0026
Percent workforce unemployed	5.70%	5.43%	.0053
Pct. families below poverty level	7.90%	7.20%	.0064
Percent voted conservative	47.06%	49.25%	.0052
Consumer price index	116.4	116.3	.0000
Medical Service Economy:			
Relative price index for physicians' Blue Shield services	101.6	100.1	.0017
Mean monthly office payroll	$4,804	$4,820	.0000
Mean monthly pay per employee	$1,307	#1,309	.0000
Number of general hospital beds	4,724	4,142	.0016
Hospital beds per 100,000	483.5	457.1	.0022
No. direct patient care physicians	991	942	.0004
Number of primary care physicians	447	397	.0017
DPC physicians per 100,000	113.59	118.13	.0015
PC physicians per 100,000	50.64	50.85	.0000
Insurance and Subsidization:			
Blue Shield enrollment	560,953	511,988	.0008
Blue Shield penetration	54.38%	55.19%	.0001
Pct. physicians Blue Shield par.	82.83%	80.24%	.0188
Blue Shield payments ($ millions)	$16.762	$16.005	.0003
Pct. Medicare line items assigned	48.6%	44.8%	.0084
Medicare allowed charges ($ mil.)	$27.806	$23.761	.0027
Per cap. state med. exp.	$69.47	$60.76	.0056

(f) Participation tends to be higher where there is more unemployment.

(g) Participation tends to be higher where there are relatively more families below the poverty level.

(h) There is less participation at places where there is a relatively greater conservative orientation in political attitudes and behavior.

(i) Cost of living apparently has no impact upon participation decisions.

All of these factors have very weak effects. If anything may be suggested, it is that there may be at least a weak tendency for more participation in areas that are somewhat more urban, have a politically liberal orientation, and are relatively downgrade in social and economic terms. Participation tends to be higher when there is relatively more poverty and unemployment, possibly suggesting a positive physician response to the conditions of needy populations.

2. Medical Service Economy

The group means for these factors appear in the middle block of Table 4-12. The factors for number of direct patient care (DPC) physicians and for primary care (PC) physician supply relative to population are not significant; all others are. The data indicate or suggest the following:

(a) The relative community price level for services covered by Blue Shield has very little bearing upon the participation decision.

(b) There is negligible, or nearly negligible, difference in office wage costs between places where participation is high and places where participation is low. The office wage factor, as measured by either of the two such factors in this list, apparently has no bearing on the participation decision.

(c) Participation is higher where there is greater hospital bed supply, whether measured in absolute terms or relative to the population base.

(d) There is no significant difference in number of DPC physicians between places where there is more assignment and places where there is less assignment.

(e) There appears to be a greater concentration of participation at places where there are greater absolute numbers of PC physicians.

(f) There tends to be less participation at places where DPC physician supply relative to population is greater.

(g) The supply of PC physicians to population is not significant.

All of these factors appear to be extremely weak as determinants of the participation decision. To the extent that factors in this set may have any effect at all, participation can be seen to be higher where there

are more hospital beds available in the community. The effects of physician supply are mixed and confusing.

3. Health Care Insurance and Subsidization Factors

In economic terms, the variables in this group act essentially as demand-related variables. Their group means are displayed in the lower block of Table 4-12. The factors for Blue Shield enrollment, percentage of Blue Shield penetration in the population, and Blue Shield payment volumes into the locality are not significant. The remaining four factors show significant differences between group means. Apparent effects associated with these factors are summarized below:

(a) Blue Shield enrollment and relative Blue Shield penetration operate in opposite directions, but neither is statistically significant. These factors probably should be ignored as determinants of the participation decision.

(b) The results suggest that the individual physician's inclination to participate may be higher at places where there is greater participation among the physician's professional colleagues in the local community.

(c) The difference in group means for total dollar volume of Blue Shield payments in the local community is not statistically significant. This factor thus apparently has no bearing on the participation decision and should be ignored.

(d) Participation is higher in localities where the overall community rate of Medicare assignment acceptance is greater. It is not clear whether this is coincidental or causal. If causal, it also is not clear whether Medicare assignment response drives the Blue Shield participation response, or vice versa.

(e) There is more participation at places where total Medicare allowed charges are higher.

(f) There is more participation at places where per capita expenditures by the state government for medical programs are higher.

The factor for percentage of physicians in the locality who participate in Blue Shield has 1.9 percent of variance explained. While this does not make it a particularly strong factor, it does emerge as the strongest factor in a generally weak group. All other factors have extremely small or negligible proportions of variance explained.

As somewhat of a surprise, it seems clear that these results do not support the notion that physicians are more prone to participate in localities where there are relatively large numbers of people covered by Blue Shield. In fact, the factors representing Blue Shield presence in the local market emerge appearing rather markedly meaningless in the participation decision. It does appear that the individual physician's participation decision may be influenced by larger scale Blue Shield participation and Medicare assignment by other physicians in the locality. This may very well be an effect more influenced by professional politics

and personal psychological response than by economic considerations. It also appears, however, that participation tends to be higher at places where private insurance and government are putting more money into the local economy for purposes related to health care.

VI. SUMMARY AND DISCUSSION OF RESULTS

A. REVIEW OF FINDINGS

This phase of the project has undertaken a thorough examination of Blue Shield participation and Medicare assignment in the state of Pennsylvania. Analytical phases of the work have sought to identify and examine factors saliently related to physicians' Blue Shield participation and Medicare assignment decisions.

Overall, from the extensive and representative physician sample used as a base for this study, it was estimated that Pennsylvania physicians on the average take assignment on 37.7 percent of their Medicare line items, representing 45.1 percent of their billed charges under the Medicare program. The distribution of physicians with respect to their Medicare assignment rates tends toward a bipolar response. Most physicians either consistently accept assignment or consistently decline assignment. Relatively few are in the middle of the assignment response distribution, where physician response to the assignment option can be characterized as most ambiguous and uncertain.

For Blue Shield programs, the study results estimated 87.5 percent of physicians to be participating with Blue Shield in the state of Pennsylvania. This is somewhat higher than would be found by reference to the PBS physician masterfile, which over the past several years has indicated physician participation rates in the neighborhood of 80 percent. A great many of the physicians listed in the company masterfile rarely or never submit claims, however, and the 87.5 percent participation rate

found in the study probably is a reasonably good estimate for physicians actually submitting Blue Shield claims with some regularity.

The major part of the study effort was devoted to determining patterns of participation and assignment, to differentiating the characteristics of those who do and do not participate or take assignment, and to developing insights into factors influencing physicians' assignment and participation decisions. The results of this effort reveal strikingly different physician response and factor association patterns for the Blue Shield participation decision, as compared to the Medicare assignment decision.

In terms of general physician characteristics, it was found that specialists have Blue Shield participation rates that are lower than those of general practitioners; but in the Medicare program, the result is precisely the opposite. In the Medicare market, specialists' assignment rates are higher than those of general practitioners. Theoretically, one would expect to find the result observed in the Blue Shield program. This is based on the argument that specialist credentials are perceived as an indicator of quality; and that the quality of services offered by a physician acts as a demand variable, with higher quality increasing demand in the open market and correspondingly giving the physician more opportunity and motivation to serve that market, foregoing the assigned/participating market. Results obtained by others on this point have been somewhat mixed, but have tended on the whole to conform with the theory.

With board certification credentials being similarly viewed as an indicator of quality, the same argument would lead to an expectation of

lower participation and assignment rates for board certified physicians. This was the observed result for Blue Shield participation; but again, the opposite result was observed for Medicare assignment in Pennsylvania. Other researchers who have evaluated this factor have rather uniformly found the theoretically expected result -- i.e., lower participation and assignment rates for board certified physicians.

Diametrically conflicting results also were obtained in the relation of the physician's age to assignment and participation. The results for Blue Shield participation showed a very orderly and well defined relationship, with participation increasing as the physician's age increases. Medicare assignment rate, on the other hand, was shown to decrease as the physician's age increases, with the relationship in this instance being equally orderly and well defined. Theoretical implications associated with the physician's age are somewhat unclear, depending upon the specific assumptions one makes concerning the concomitants of age and experience. Paringer (1980) found Medicare assignment to decrease with increasing physician age.

An area of agreement in study results was on the effects of FMG status. FMGs were found to have higher Blue Shield participation and higher Medicare assignment rates. This is consistent both with theory and with previous findings by others.

Another area in which there was at least partial agreement was on the effect of the number of physician associates with whom a physician is involved in his practice. Physicians in medium to large size groups were found to have greater Blue Shield participation and greater rates of Medicare assignment. The results were mixed, however, on the effects of

being associated with only a small number of other physicians. Physicians practicing with one to three physician associates have the lowest Blue Shield participation, but have a relatively high rate of Medicare assignment.

In looking at some key factors used to characterize a physician's practice, substantial differences again were found. Larger patient rosters are associated with higher Medicare assignment, but lower Blue Shield participation. Larger annual dollar volume is associated with higher Medicare assignment and lower Blue Shield participation. Physicians who deal in higher-valued services and physicians whose relative price levels are higher also have higher Medicare assignment, but lower Blue Shield participation. Larger relative cut-backs from billed to allowed charge were found to diminish Blue Shield participation, but not to reduce Medicare assignment. One area of agreement was in the annual total volume of services delivered and the intensity of services per patient. Increases in either of these factors were associated with increases in both Blue Shield participation and Medicare assignment. A further difference, however, was in the apparent relative strength of the effects identified. The strength of the effect upon Medicare assignment was quite strong for some factors, but all of the observed effects upon Blue Shield participation were substantially weaker.

The effects of practice locality characteristics were much more uniform than the disparate, and often opposing, effects described above for general physician characteristics and physician practice characteristics. Among the general demographic and socioeconomic factors, higher population density, a more liberal political orientation, higher

levels of poverty and unemployment, and other relatively downgrade social and economic indicators all were found to exert a positive (increasing) effect upon both Blue Shield participation and Medicare assignment. A slight difference was found in that localities with a high cost-of-living are associated with higher Medicare assignment rates, whereas Blue Shield participation does not appear to respond to area cost of living differences. The observed effects upon Medicare assignment were relatively weak, but for Blue Shield participation they were even weaker, often nearly negligible.

Blue Shield participation and Medicare assignment rate responses were in agreement for price, cost, and supply factors used in characterizing the medical services economy in a practice locality. Increases in hospital bed supply, and in the number of primary care physicians in a locality were associated both with greater assignment and with greater participation. Both Blue Shield participation and Medicare assignment failed to exhibit any clear relationship to other physician supply variables. There also was agreement in that office wage factors had little or no effect upon either Blue Shield participation or Medicare assignment. There was slight disagreement on the effects of generally higher price levels for medical services in an area. Medicare assignment showed an upward response to generally higher medical services prices, but Blue Shield participation showed no response. Again, the Medicare assignment effects were weak, and the Blue Shield participation effects were almost negligible.

Finally, there also was general agreement on the effects of health care insurance and subsidization factors. These effects can be summarized

in the generalization that assignment and participation tend to be higher in areas where there are higher volumes of health insurance payment dollars and higher levels of government expenditure for medical programs. There is a curious area of disagreement in one specific component of this effect, however. A greater Blue Shield presence in the market -- whether measured in terms of absolute subscriber enrollment counts, relative penetration as a percentage of local population, or benefit payment dollars -- is associated with higher levels of Medicare assignment; but a greater Blue Shield presence in a local market does not generate any increase in physician participation with Blue Shield.

Some of the observed results tentatively suggest that individual physicians exhibit a greater inclination to participate in areas where there is a generally higher level of physician participation with Blue Shield, and that they also exhibit an inclination to higher levels of assignment acceptance in areas where there is generally higher physician assignment acceptance. It may be that this is merely an illusion arising from a tautological relationship between the locality variables and the individual physician variables describing assignment/participation in the data base; or it may validly reflect a disposition of individual physicians to conform to the behavior of their peers in their assignment and participation decisions.

There also are indications of behavioral crossover between physicians' Blue Shield participation decisions and Medicare assignment decisions. This is evidenced by results suggesting that physicians who participate with Blue Shield also tend to accept assignment on Medicare. Blue Shield participating physicians have an average Medicare assignment

rate that is more than twice as great as the assignment rate for nonparticipating physicians (40.4 percent, compared to 18.8 percent).

B. DISCUSSION OF RESULTS

Summarizing the empirical findings from this study in a slightly different way, a profile of the typical physician who consistently accepts Medicare assignment would depict him as being a young, board certified specialist. This typical consistently-assigning physician would have a high volume practice, with a large overall patient roster. The types of services he delivers would be relatively high-valued, and his fees would tend to be higher than those of other physicians doing the same mix of procedures. He would deliver a high volume of services, and he would have a relatively high level of intensity of services delivered per patient. All this would contribute to a large dollar volume in his practice.

For Blue Shield, the profile with respect to general physician characteristics and practice characteristics would be almost perfectly reversed. The profile given above for the typical physician who consistently accepts assignment on Medicare would also serve almost perfectly as a profile of the typical physician who does not participate with Blue Shield. The only exceptions would be that high volumes of services and high intensity of services per patient on the Blue Shield side would tend more to be associated with the participating physician. Otherwise, the above profile describes the representative nonparticipating doctor.

While the Medicare assigning doctor and the Blue Shield participating doctor are almost perfect mirror images of one another, they tend to have the same kind of practice locality profile. The participating or assignment-taking physician typically will be found in a locality having a relatively high population density, a relatively liberal political orientation, somewhat higher than average proportions of unemployed workers and families under the poverty level, and other generally downward-tending social and economic characteristics. In addition, the locality will have a large hospital bed supply and a large number of primary care physicians. There will be a relatively high volume of money entering the local medical services economy from health insurance and government program sources.

In an overview by broad classes of factors, it appears that Medicare assignment is determined more by basic individual physician characteristics and practice characteristics than by characteristics of practice locale. Practice characteristics describing size and volume of practice, as well as the relative value of services delivered, appear to have particularly strong influence upon the assignment decision. The physician's specialty alone is a strong determinant, accounting for 14.5 percent of the variance in assignment rates. The county level locale accounts overall for a relatively much smaller 7.9 percent of variance, with specific characteristic factors for locality on the whole showing much weaker influence than the specific factors used to characterize practices.

The potential explanatory relationships in general appear weaker for Blue Shield participation than for Medicare assignment. As in the case of

Medicare assignment, a greater amount of variance is explained by specialty than by practice locale (county), but for Blue Shield participation they explain a mere 4.1 percent and 3.7 percent, respectively. The explanatory power of factors describing individual practice characteristics in relation to Blue Shield participation appears very weak.

In summary assessment, there appears to be at least some measure of systematic and rational explanation for physicians' Medicare assignment decisions and behavioral responses, even if contrary to the presumed theories in some ways. On the other hand, there appears to be no strong or compelling rational explanation for Blue Shield participation or nonparticipation. Perhaps this may be because Blue Shield participation decision processes are more essentially political and psychological than rationally economic in nature.

How can we explain the very remarkable difference in physicians' behavioral responses to the Blue Shield participation decision on the one hand, and to the Medicare assignment decision on the other, in relation to essentially identical situational factors in some cases? The answer may lie in the fundamental difference between an all-or-nothing commitment in the Blue Shield participation decision, and the far more free and flexible claim-by-claim option for Medicare assignment. The effects and relationships observed for Blue Shield participation, although weak, tend to be qualitatively and directionally consonent with the outcomes predicted by economic theory. Perhaps the claim-by-claim assignment option under Medicare produces operational and practical impacts upon physicians that are much more like those which would occur in an open

competitive market than like those to be expected from a full-commitment participating market. Alternatively (or perhaps additionally), it may be conjectured that if Blue Shield participation decisions are essentially political and/or psychological, such considerations might override the normal effects of rational economic factors.

C. POLICY IMPLICATIONS

From a policy perspective, the results of this study offer scant guidance to specific steps that might be taken to increase either Blue Shield participation or Medicare assignment rates. While some interesting and illuminating insights to the concomitants of participation and assignment acceptance have been provided, it remains unclear just exactly what motivates physicians to participate in insured medical services markets. It has been shown, of course, that physician participation with Blue Shield in Pennsylvania already is relatively high; and it hardly would be reasonable to expect more than marginal improvement to the rate of participation which already exists. The formulation of policy initiatives to increase assignment rates for the Medicare Part B program, on the other hand, must be acknowledged as a relatively more pressing problem. Perhaps the principal (and most radical) alternative to the present policy would be to make Medicare assignment an all-or-nothing option similar to the Blue Shield participation arrangement. This study did not include any policy variables to test that proposition, however; and it is quite likely that the only valid way to test this proposition would be through rigorous and carefully controlled field experimentation.

The study results offer some encouragement for an all-or-nothing Medicare assignment option, pointing out that the physician with a high assignment rate tends also to be a high volume provider. This holds whether taken for the physicians' aggregate Blue Shield and Medicare practice volume, or for his Medicare practice only. It also holds irrespective of whether volume is measured in terms of patients, services, or dollar volume (see Tables 4-6 and 4-7). It may be reasonable to presume that any physician who already consistently opts to accept assignment would not find mandatory assignment to be particularly objectionable. The real potential for improving Medicare assignment rates probably exists among physicians who are relatively low volume providers, and who also are relatively low-priced. Faced with a mandatory requirement to accept assignment on all Medicare cases or on none, a certain number of these probably would opt for participation. If the all-or-nothing Medicare participation option were accompanied by a strong beneficiary education program to promote the values of seeking participating (i.e., assignment accepting) physicians, perhaps a significant number of Medicare patients would be diverted from those providers who opt "out" to those who opt "in."

Even though the main potential for improving assignment rates may exist among providers who are low volume and/or low-priced, the dollar value of the incremental return for developing this potential still may be quite worthwhile. If it can be assumed that the only physicians who would be almost certain to opt "out" would be those who already consistently decline assignment, then the results presented in Chapter IV would suggest that the available pool of physicians who tend to waver somewhat on their

assignment decisions (accepting assignment on more than 10 percent of line items, but not more than than 90 percent) is quite large -- on the order of 46 percent of all individual physicians [see Figure 1(a) on page 4-39]. If individual physician assignment rates are expressed in terms of percent of billings assigned, rather than in terms of line items assigned, the available pool of physicians with mid-range assignment rates (11-90 percent) again is of approximately the same order, including some 44 percent of all individual physicians [Figure 1(b), page 4-39].

REFERENCES

Ferry, Thomas P., et al. "Physician Charges Under Medicare: Assignment Rates and Beneficiary Liability," Health Care Financing Review, 1:49-73, Winter, 1980.

Huang, Lien-Fu and Orest Koropecky. The Effects of the Medicare Method of Reimbursement on Physicians' Fees and Beneficiaries Utilization. Volume II, Part I. Washington, D.C.: Robert R. Nathan Associates, April, 1973.

Mitchell, Janet B. and Jerry Cromwell. Physician Behavior Under the Medicare Assignment Option. Final Report. Chestnut Hill, Mass.: Center for Health Economics Research, January, 1981.

Mitchell, Janet B., Jerry Cromwell and Rachel Schurman. Physician Participation in Public Programs. Chestnut Hill, Mass.: Center for Health Economics Research, September, 1981.

Paringer, Lynn. "The Medicare Assignment Rates of Physicians: Their Responses to Changes in Reimbursement Policy," Health Care Financing Review 1:75-89, Winter, 1980.

Pennsylvania Blue Shield, 1981 PBS Doctor Survey, Camp Hill, Pa.: Research Division, July, 1981.

Sloan, Frank, Janet Mitchell and Jerry Cromwell, "Physician Participation in State Medicaid Programs," The Journal of Human Resources, XIII:211-245, 1978.

Sloan, Frank and Bruce Steinwald, "Physician Participation in Health Insurance Plans: Evidence on Blue Shield," The Journal of Human Resources, XIII:237-263, 1978.

Yett, Donald E., William Der, Richard L. Ernst and Joel W. Hay, "Blue Shield Plan Physician Participation," Health Care Financing Review, 2:9-24, Spring, 1981.

(BLANK)

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part Five:

The Role of Competition in Physician Pricing and Output

By: Jerry Cromwell, Ph.D.

The work described in Part Five of this Final Report was performed by Health Economics Research, Inc., under subcontract from Pennsylvania Blue Shield. The author, Dr. Cromwell, is President of Health Economics Research, Inc.

I. STATEMENT OF THE PROBLEM

A. INTRODUCTION AND OBJECTIVES

The spiraling cost of physician services with the spread of public and private insurance has led to extensive public intervention in the market for physician services. Fees are regulated, supply is manipulated in various ways, and utilization controls are applied. Much of the regulation and planning effort, however, has been frustrated by unintended side-effects. Greater supplies of physicians have led to increased access and utilization with little or no decline in fees. The mix of services has become more complex, due in part to technological advances in medicine, but also to an apparent effort by physicians to maintain incomes at desired levels.

The study presented in this report is designed to address the public policy concern over the best way to control expenditures in the physician market. First, and most important, is the general question of physician-induced demand. In the face of increased competition, do physicians induce more demand for their services in order to preserve established income-leisure preferences? Physician-induced demand is still a very controversial issue in the economics profession. Many neoclassical economists have taken issue with the conventional wisdom that physicians, as imperfect consumer agents, encourage unnecessary utilization of medical services. Arguments against induced demand include:

(1) Absence of a theoretical foundation for explaining why physicians differ in their inducement or why they don't all induce up to the limit of their capabilities;

(2) Misspecification of geographic market areas in empirical work (e.g., bordercrossing);

(3) Omitted variables which affect price and quality of product (e.g., waiting and travel time, amenities);

(4) Lower physician incomes in physician dense areas; and

(5) Constant markups over costs across areas with different physician densities.

Certainly others exist as well. While in any study imaginable one can conjure up a defense of the no-inducement theory, the defense usually misses the public policy issue of unnecessary utilization. Economists consider "unnecessary" either a personal value judgment or a function of medical opinion and hence out of the realm of economic analysis. So long as consumers are moving down along a fixed demand curve, shifting (inducement) has not occurred.

But even if demand remained constant, the question of appropriate utilization remains. Why? Because of insurance and the resulting moral hazard. Consumers will consume health services beyond socially optimal levels unless physicians act as perfect societal agents, a highly unlikely situation (and against the Hippocratic Oath in many instances). Therefore, it is valuable to determine utilization patterns across geographic areas, even if demand remains constant. If, in addition, extra utilization in physician-rich areas is not all price-induced, the problem of unnecessary utilization is compounded. It is the intention of this study to investigate physician volume and pricing more carefully, trying as much as possible to redress limitations in the existing empirical literature (e.g., bordercrossing, price differences).

We are interested in exploring the sources of fee differentials in various ways, testing hypotheses regarding the extent of institutional price discrimination, how discrimination varies by procedure, and in what ways physician-density ratios influence the price and utilization of physician services. Answers to each of these questions would shed light on the best way of restraining health care costs.

The study phase addressed in this report has the following objectives:

(1) Construct a longitudinal cross-section of physician utilization and fees for the period 1973-78 across substate physician market areas in Pennsylvania using Pennsylvania Blue Shield-Medicare claims data. Utilization and fees will be decomposed by 23 procedures in the following major benefit categories: surgery, hospital visits, office visits, radiology, pathology, EKG, consultation, obstetric delivery;

(2) From the longitudinal cross-section, calculate rates of change in utilization and fees and present in tabular form for Pennsylvania as a whole and for relevant analytical subcomponents (e.g., high-low physician population [MDPOP] ratio);

(3) Conduct an econometric test of physician inducement using fees for each procedure in a reduced-form regression on MDPOP, holding relevant demand and supply variables constant.

B. BACKGROUND

The single most striking fact about the national health care budget is its size. Total health expenditures in 1980 were $247 billion, or 9.4 percent of the Gross National Product (Gibson, 1981). The public share of this budget was $104 billion, up nearly ten-fold from 1965. A large proportion of these health care costs are dependent on the physician, either directly through physician expenditures or indirectly through

hospital admissions, laboratory tests, and other procedures ordered by the physician.

Expenditures for physicians' services alone are estimated at $35 billion in 1978, a 161 percent increase from 1970 (Dyckman, 1978). Based on 1976 data, we can project physician outlays of $4.69 billion and $2.33 billion under Medicare and Medicaid programs, respectively. This dramatic increase in physician expenditures can be decomposed into two parts: fee inflation and increased utilization. On average from 1970 to 1976, physicians' fees rose 7.8 percent per year compared with only 6.5 percent annually for all non-medical care prices (Dyckman, 1978). During 1977, fees increased 9.2 percent while non-medical care items in the Consumer Price Index increased 6.6 percent. At the same time, physician visit rates have been rising nationwide. The per capita number of surgical operations, for example, has increased 17 percent from 68 per 1,000 population in 1969 to 79 per 1,000 in 1976 (AMA).

The government has three potentially powerful tools at its disposal to control medical care expenditures: (1) controlling the supply of physicians; (2) physician fee setting; (3) utilization controls. If physicians are able and willing to "shift" demand for their services, however, these policies may lead to unanticipated results.

Public health care policy and economic research in the field of physician behavior currently exhibit schizophrenic tendencies, born out of frustrated attempts to explain, then control, the spiraling inflation in medical care costs. Earlier policies, designed to increase access to physician care by increasing physician supply, held out the hope that through increased competition among suppliers, costs could be controlled

as well. But something went wrong. Although access improved significantly (see, for example, Davis and Reynolds, 1976), expenditures on physician services escalated considerably more than the increases in per capita utilization. Clearly, expanding supply was not having the expected depressing effect on unit prices predicted by orthodox economic theory. Well-intentioned policy directed at increasing market competition, as opposed to government regulation, was not working.

Then, reinforced by studies forecasting the end of physician shortages on an aggregate basis, there was a dramatic reversal of policy direction, calling for new constraints on the production of medical school graduates and importation of Foreign Medical Graduates (FMGs). This redirection was bolstered, in part, by mounting evidence that physicians were exhibiting discretionary control over the demand for their services, thwarting attempts to promote price competition. That physician induced demand plays a dominant role in medical care utilization is by no means generally accepted, however, by either physicians or economists. Many deny such a role on theoretical and/or policy grounds. More traditional economists find the notion of unbridled induced demand unacceptable, for it undermines most of the predictive and normative conclusions derived from theory. Furthermore, it renders useless the more traditional forms of regulatory intervention, calling for more radical solutions to the cost crisis. Why? Because price or quantity regulation can be offset by physician-induced demand shifts, leaving total revenues unchanged. Only if price and quantity are simultaneously regulated can public policy have any hope of constraining expenditures.

Policymakers are faced with a serious dilemma. Should they deregulate the market and permit more competition in the hope that the proper incentive structure will lead to improved efficiency and lower costs, or should they give up on the market solutions, fully recognize the unique characteristics of the market militating against real competition, and accelerate regulatory efforts? Neither is an obvious choice. The evidence in favor of market-imposed cost constraints in the face of rising insurance coverage is limited indeed. On the other hand, little comfort is derived from experience with regulatory intervention in other industries. Particularly discomforting is the so-called "tarbaby syndrome," viz., as one regulation is put into place, pressures build, leading to perverse responses requiring further regulation. Eventually, a jungle of overlapping regulations strangles any innovative, competitive elements left in the industry, leaving the survivors to "enjoy" a protected market.

Other explanations, however, seem to beg the question of what to do with physician regulation, although the clear implication is that the market is functioning properly and little regulation is required. For example, it has recently been asserted in a strong theoretical context by Sloan and Feldman (1978) that part of the positive correlation between physician-population ratios, fees, and per capita utilization can be attributed to lower time prices and increased amenities to patients living in physician-rich areas. While it is, strictly speaking, true that abstract demand functions should incorporate both the prices and variations in the nature of the product, it is not clear what policy prescriptions result from incorporating them. If patients enjoy more

physician visits because of lower time prices, should public and private insurance programs pay for these visits? If physicians are willing to provide more amenities -- e.g., nicer waiting rooms, more time with patients -- should society pay for these amenities? Policymakers would be much less concerned about shifts of this nature if: (a) patients were paying for these amenities out-of-pocket, or (b) the higher fees resulting from a higher amenity-intensive service mix did not eventually increase the reimbursement rates of public insurers. Under UCR methods, however, usual physician charges enter directly into the calculation of usual and customary reimbursement rates. Thus, public payments are often higher in physician-rich areas, adjusted for cost-of-living, because of higher amenity levels and stronger private demand due to lower time prices.

There is no question that physician-induced demand is a serious problem from a policy perspective. If it exists, and if it plays a major role in medical care utilization, then it must be taken very seriously. A fundamental rethinking of the modes of intervention would be required in order to control costs as the "natural constraints," i.e., consumer sovereignty, would be missing from the regulatory equation. In the final analysis:

> society must decide whether a centralized system (public-sector allocation) will make fewer errors than a decentralized system with inducement. An estimate of the amount of inducement could inform that decision. If the amount of inducement is small, the misallocation from inducement will be correspondingly small, and under such circumstances a decentralized system may well be preferable. (Fuchs and Newhouse [1978, p. 10]).

C. SUMMARY OF FINDINGS

The issue of physician-induced demand was explored in this study using a longitudinal data file derived from Pennsylvania regular Blue Shield business plus Medicare claims reimbursements over a six-year period, 1973-1978. Charges, payments, workloads, and patient utilization (or intensity) rates were determined on a per procedure basis for 23 selected procedures: 11 surgical; 6 visits; and 6 nonsurgical diagnostic tests. The data base included claims from a panel of 8,099 physicians, each performing at least one of the 23 procedures continuously throughout the six years. Aggregate price and quantity indices for each physician were then calculated using data from all 23 procedures, with relative prices forming the aggregation weights. Finally, all pecuniary data were deflated by a regional cost-of-living index, although no explicit time-series deflator was used because of the lack of such an index on a substate basis. Thus, aggregate price and payment data reflect regionally (but not temporally) deflated prices per RVU, while workloads and intensity are in terms of RVUs per physician and per patient. Systematic differences in physician prices and output, therefore, cannot be attributed either to service mix or to regional cost effects.

The analysis included a variety of descriptive and econometric work, hierarchically ordered from the most aggregated, per physician, level to the most disaggregated, per procedure, level. Findings are summarized by topic area (e.g., fees) and by type of analysis (descriptive, econometric).

1. Fees

Overall fees per RVU rose 9.1 percent per year, from $5.92 per RVU in 1973 to $8.60 in 1978. Econometrically adjusting for trends in demand (e.g., income, insurance coverage), the rate of fee inflation was still about 6.5 percent. The biggest adjusted yearly increase (9 percent) came in 1975, the year after wage-price controls were removed.

Absolute fees per RVU varied directly with the extent of physician concentration. In areas with the highest physician-population (MDPOP) ratio, charges per RVU in 1975 were $7.36, a full 14 percent above the average charge in low MDPOP areas ($6.48).

Fees per RVU rose at about the same, undeflated, 9 percent per annum in all areas, essentially independent of physician concentration. Nor was any measure of physician availability correlated with weighted fees per RVU in the aggregate fee regressions.

From these results we conclude that a greater supply of physicians per capita, while not raising fees overall, does not depress fees either. The lack of strong negative correlation has serious implications for future Medicare and health care expenditures on physicians' services, what with the rapid growth in supply projected through 1990.

Fee levels and trends varied both by specialty and by procedure. Average fees per RVU in 1978 were as follows:

Specialty	1978 Fee/RVU	1973-'78 Pct. Δ Fee/RVU
OB-GYNs	$10.04	57%
Surgical specialists	9.22	47
Medical specialists	9.08	46
Other specialists	9.06	38
General Surgeons	8.85	51
Internists	8.75	44
General practitioners	7.64	42
All physicians	8.56	45

Obstetricians and gynecologists had by far the highest fees per RVU, followed by surgical specialists (e.g., neurosurgeons, orthopedic surgeons, and ophthalmologists), medical specialists (e.g., cardiologists, pediatricians, neurologists), and other specialists (e.g., psychiatrists, radiologists, pathologists). General practitioners had the lowest charges per RVU, about 25 percent below OB-GYNs, and 12.7 percent below the surgical/medical specialists, holding other variables like board certification constant.

The rate of fee inflation was highest, as well, for OB-GYNs (57 percent over five years), while other specialists exhibited the lowest rate (38 percent); GP fees per RVU rose 42 percent; general surgeons, 51 percent.

Fee inflation, while not differing by specialty across high, medium, and low physician-population (MDPOP) market areas, does show an absolute widening of the fee gap. For example, GP fees per RVU were $0.76 higher in high MDPOP areas than low areas in 1973, the gap widening to $1.20 by 1978. Such gaps cannot be explained either by specialty or by procedure mix, nor can they be attributed to regional cost-of-living differentials.

Among the individual procedures, tonsillectomy fees rose the fastest, 13.3 percent yearly, followed by vaginal deliveries and D&Cs, at 12.9 percent. Lens excisions and resection of prostate surgery had the lowest increases among surgical procedures, 8.7 and 9.3 percent, respectively.

Fee inflation for office and hospital visits was somewhat lower, averaging between 7.5 and 11.0 percent annually. A definite shift away from brief to intermediate office or hospital visits was observed, however, which left the number of visits per patient seen constant. This upgrading contributed only to the rate of visit expenditure inflation, however, due in part to the slower growth in intermediate visit fees relative to brief visits.

The six diagnostic tests exhibited the lowest inflation rates, ranging from 3.6 percent (complete blood count) to 6.5 percent (upper GI) per year. In 1973, the six tests averaged $21.28 per patient seen, increasing to $26.22 in 1978, a 25 percent increase.

While the rate of fee inflation for individual procedures was generally uncorrelated with the extent of physician competition, absolute fees, regionally adjusted for cost-of-living, were positively related to MDPOP, although not for every procedure. The following are illustrative of the fee differentials across high and low MDPOP areas as of 1978:

Procedure	High MDPOP	Low MDPOP	High/Low
Colles Fracture	$165.02	$164.71	1.00
Tonsillectomy	162.67	164.04	.99
Prostate Resection	640.81	574.42	1.11
D&C	171.29	137.76	1.24
Delivery	434.68	324.85	1.34
Brief Office Visit	9.57	8.73	1.10
Intermediate Hospital Visit	14.29	12.02	1.19
Chest X-ray	23.12	21.74	1.07
EKG	20.15	19.74	1.03
Urinalysis	3.47	2.99	1.16

The High/Low column shows that fees in high MDPOP areas tend to be higher than those in low MDPOP areas by proportions ranging as high as 34 percent. Differentials for OB-GYN procedures and urinalysis proved to be much greater than for other procedures.

Econometric results holding exogenous supply and demand factors constant, while showing no competitive effects on overall fees, did exhibit definite effects when disaggregated by specialty or procedure. For the sample of 2,584 GPs and FPs, average fees per RVU were lower in areas where these physicians were more plentiful relative to the population. The effect, however, is relatively small: a doubling of GPs per capita reduces average GP fees per RVU about $0.34, an elasticity of .06. Offsetting this negative own supply effect on GP fees is a positive, statistically significant cross-price effect of non-GPs; that is, GPs practicing in areas with more physicians per capita charge higher fees, thereby diluting much of the effect of own-specialty competition. This finding is consistent with previous work by Steinwald and Sloan (1974).

Results from the medical and surgical equations reveal some additional evidence of inducement. The relative supply of medical

specialists was found to be positively related to average medical specialists' fees per RVU (an elasticity of .037) while the relative number of direct patient care physicians was positively correlated with surgical fees (an elasticity of .02), although the own-specialty effect was insignificant. GP supplies, by contrast, were negatively correlated with medical specialists' fees (an elasticity of .09). Apparently for specialists, fee competition is not direct among peers, but rather, manifests itself indirectly through interspecialty competition. More specifically, increases in GPs per capita, holding specialist supplies constant, does depress both GP and specialist fees -- particularly medical specialists like internists, pediatricians, dermatologists, and allergists. The rapid phasing out of GPs in favor of specialists does not bode well for the future in terms of competitively lower fees through supply increases alone. Changes in reimbursement arrangements also may be necessary.

Regressions also were run on Medicare-assigning and non-assigning physicians. The results showed that:

- Non-assigning physician fees per RVU were slightly lower than for assigners (holding specialty, etc. constant); however,
- Fees per RVU rose much faster for non-assigning physicians (40 vs. 27 percent); also,
- Fees of assigning physicians were significantly higher in high MDPOP areas, ceteris paribus; furthermore,
- Medicare Part B expenditures per capita were positively correlated with average fees, particularly for non-assigning physicians.

While this last relationship may not be strictly causal, it nonetheless emphasizes the importance of constraining physician fees in some way to arrest Medicare outlays. Also, no evidence is found that physician supplies reduce fees Medicare must pay; in fact, the results suggest the opposite.

Thirteen procedure regressions were run on selected surgical, medical, and diagnostic services. In six of the regressions where MDPOP was significant, it was always positive, especially for pathology tests, office and hospital visits, and tonsillectomies. The first could be taken as evidence in favor of Reinhardt's hypothesis that diagnostic testing may be more inducible, although apparently only for pathology tests (at least of the diagnostics examined).

MDPOP proved to be consistently related in a positive way to three types of visits: brief and intermediate office, and intermediate hospital. In previous research this anomalous finding has been attributed to either: (a) non-price competition, or (b) greater reduced fees and bad debts, neither of which has been addressed in this study. If physicians in highly competitive areas provide longer visits (which they do) or other important amenities, then interarea charges are not strictly comparable. Whether third parties should be responsible for paying for such amenity-induced differences is certainly arguable. Physicians may also choose to keep stated price artificially high for reimbursement purposes, knowing they will be discounted by both patients and their insurors. While we do not know about patient collection rates, we do know that Blue Shield and Medicare payments are higher in more competitive areas -- as discussed below.

Finally, as in earlier work, GPs per capita were negatively related to fees for four procedures (tonsillectomies, chest x-rays, brief office visits, and urinalyses), and were positively related for one (Colles fractures).

2. Payments

Physician charges generally are not paid in full by either Blue Shield or Medicare, and it is possible that reimbursement screens used by Pennsylvania Blue Shield could equalize relative charges across areas and specialists. Such, however, is not the case.

Blue Shield/Medicare payments per RVU were about one dollar less than charges on average, a 16 percent reduction. Payment differentials across high and low MDPOP areas were somewhat less than for average charges, 9 versus 14 percent, but clearly they had not been eliminated. In 1975, the average charge per RVU was $7.36 in high MDPOP areas while average payments were $6.02, an 18 percent reduction. The corresponding figures for low MDPOP areas were $6.48 and $5.54, a 15 percent reduction.

Rates of reduction differed somewhat by broad specialty group although payments, too, were invariably higher in more physician-dense areas. For GPs and other specialists (e.g., radiologists), the rates of reduction were 14 and 17 percent, respectively, irrespective of geographic areas. For medical and surgical specialists, payments did tend to be relatively less than charges in high MDPOP areas, implying at least an implicit attempt to narrow the fee gap. Payment/fee ratios for these specialists were approximately .85 in low MDPOP areas compared to .80 in

high MDPOP areas. Payments in high MDPOP areas were still 5-8 percent above those in low MDPOP areas, however.

Both fees and payments (per RVU) declined uniformly with physician work experience, which seems anomalous if there is a positive return to learning-while-practicing -- at least until skills begin to obsolesce. Payment/fee ratios for 1978 for selected age cohorts were as follows:

Physician Age Group	Fee per RVU	Payment per RVU	Payment/Fee Ratio
27-38	$9.18	$7.67	.84
39-42	9.09	7.52	.83
47-49	8.68	7.29	.84
50-52	8.71	7.34	.84
60-63	8.34	7.07	.85
64-68	8.02	6.86	.86

Physicians in the youngest decile were charging $9.18/RVU compared to only $8.68 for physicians in the prime working years, age 47-49. Payment reduction rates were more or less constant across age cohorts, which is to be expected given UCR reimbursement based on fees.

Part of the discrepancy may be explained by increasing specialization among younger physicians; but even in fee regressions, fees per RVU exhibited a negative, L-shaped relationship with years of work experience. Ceteris paribus, fees fall rapidly across younger physician cohorts, bottoming out in the later years of practice. Thus, simple negative correlation of fees with physician age cannot be completely explained by specialty or procedure mix, cost-of-living differentials, demand factors, or other physician credentials. And

although UCR methods of reimbursement do place certain constraints on payments to new market entrants, they apparently are not adequate enough to equalize payment rates across physicians with identical characteristics.

3. Workloads and Intensity

A third area of investigation included physician workloads and intensity of care per patient. Primarily at issue here is the relationship between physician competition, work effort (or productivity), and patterns of care. Neither workloads nor patient care intensity uniquely capture physician inducements, for utilization may result not from demand shift, but from a downward movement along an unchanged demand curve as prices fall. The fact that no inverse relationship was found between MDPOP and fees per RVU, on the other hand, allows us to draw stronger conclusions than we otherwise might.

Physician Blue Shield/Medicare workloads (i.e., RVUs/physician) rose 2.3 percent per year compared to 9.1 percent for fees. Medical specialists had the highest workloads, double those of GPs. The relatively low GP workloads are expected, given their lower internalized ancillary care and Blue Shield non-coverage of routine, preventive care.

Workloads exhibited an inverted U-shape with both physician age and MDPOP, being highest for physicians aged 43-49 practicing in areas of medium physician availability. Workloads were lower in both low and high MDPOP areas, which may be attributable to lower Blue Shield penetration in rural areas and a smaller, pro rata demand in urban, physician-dense areas. When other variables like specialty were held constant, however,

workloads showed a consistent, negative relationship with MDPOP, which is expected if more physicians are having to compete for relatively fewer patients. Physicians presumably offset some of their lost output by setting higher fees.

An interesting relationship exists between workloads and fees across MDPOP areas. The product of the two gives total Blue Shield/Medicare charges for the 23 procedures. Under simple competitive assumptions (discussed in detail in Chapter II), we would expect both workloads and fees to be lower where physicians are more abundant, yet we already know this to be untrue: workloads are lower (at least in high MDPOP areas), but fees are higher. In most instances the two effects offset each other, resulting in nearly constant total charges per physician, as illustrated below:

	Total Blue Shield/Medicare Charge per Physician		
Specialty	Low MDPOP	Medium MDPOP	High MDPOP
GPs	$ 7,188	$ 7,377	$ 7,050
Medical Specialists	15,603	15,661	15,127
Surgical Specialists	10,134	11,117	10,287
Other Specialists	7,320	12,262	8,544
All Physicians	9,688	10,738	10,657

Only the Other Specialists group shows a broad deviation across areas, due to their relatively high workloads in medium MDPOP areas. Of course, such relationships may be coincidental and Blue Shield penetration and urban/rural demand does vary systematically by market area. Total charges of physicians in low MDPOP areas may be relatively "low" because fewer

patients have Blue Shield coverage while workloads in high MDPOP areas are "higher" than expected given a simple prorating of demand because of greater medical need. Still, it is remarkable that the average physician in high MDPOP areas submits bills for essentially the same Blue Shield/Medicare total amounts even though there are 2.5 times as many physicians per capita as in low MDPOP areas.

Our last area of investigation involved the intensity of care delivered per Blue Shield or Medicare patient seen in any year. Under greater competition, physicians would be expected to have to "share" patients more in terms of referrals and services delivered, as well as simply seeing fewer of them. They may try to compensate for this competitive sharing effect by recommending more intensive care (e.g., more hospital and office visits, more lab tests, more x-rays).

A real problem in analyzing intensity over time is presented by non-repetitive surgery, which imparts a downward bias to all intensity measures where it is included. Only limited statements about inducement can be made given this caveat. For example, both tonsillectomies and lens excisions declined rapidly as a percent of patients seen for our physician panel, yet fees rose much more rapidly for the former, non-repetitive procedure. While absolute demand for tonsillectomies has been falling nationwide, it has not been falling for lens excisions. Any one physician group, however, will show a declining excision rate as they perform the procedure on a shrinking number of candidates unless offset by new patients. In Pennsylvania, the number of elderly which form the primary pool for lens excision grew far faster than the number of ophthalmologists, actually resulting in an almost constant eligible pool.

Adjusting for this gives a nearly constant surgery rate, thereby reducing physician pressures to raise fees to offset declining demands -- as hypothesized to be the case with tonsillectomies.

Trends in intensity were generally negative, reflecting the dominance of non-repetitive surgery, with a few important exceptions. Intensity actually increased for general surgeons and other specialists practicing in high MDPOP areas. As other specialists like pathologists and radiologists perform non-repetitive services for the most part, it is not too surprising that their intensity rose, particularly as they depend upon referrals from many other specialties; but why intensity per patient seen would rise for surgeons is quite unexpected in light of the strong downward bias in the measure for this group. One explanation might be that in surgeon-dense areas, general surgeons have an increasing tendency to practice like GPs and internists, with many more office visits and ancillaries. A less sanguine interpretation would suggest that they perform more unnecessary, elective surgery (e.g., tonsillectomies, herniorrhaphies) to maintain target incomes. Only a much more detailed investigation of their practice patterns across market areas could discriminate between the two hypotheses.

Most of the ancillary tests showed positive trends in intensity, headed by complete blood count and urinalyses at 4.1 and 3.2 percent annually, respectively. Upper GIs and EKGs actually had slight declines. Ancillary intensity was much higher in high MDPOP areas than elsewhere: chest x-rays (28 percent of patients seen in low MDPOP areas versus 36 percent in high MDPOP areas); EKGs (31 versus 51 percent); and urinalyses (31 versus 46 percent). How much of this discrepancy is

attributable to greater internalization of production in high MDPOP areas is unknown, but it is unlikely to account for such wide disparities. Nor can the difference be attributable to specialty mix, as ancillary intensity rates were similar within specialty.

D. OVERVIEW OF STUDY

The next section provides a brief review of the literature, followed by a general theory of demand creation, or inducement, based on area markets for physician services. The theory is then respecified in terms of individual physicians who form the unit of analysis in this study. Section IV summarizes in detail the Pennsylvania Blue Shield data base developed for this study and provides a list of the dependent and independent variables. Sections V and VI present findings, first in descriptive, then in econometric form.

II. REVIEW OF THE INDUCEMENT LITERATURE

Economists have been studying the subject of demand inducement in the medical sector for over a decade now, beginning with Feldstein's (1970) pioneering work. Sloan and Feldman (1978), in a watershed paper done for the Federal Trade Commission, conducted an exhaustive theoretical and empirical critique of this literature through 1977. Since then many new studies have appeared, materially adding to the body of knowledge on the topic. A review of the literature up to 1978 was produced as an earlier report in this project (Juba, 1979). The purpose of this chapter is to update Juba's earlier review, showing how theory and empirics have evolved more recently.

A. SUMMARY OF LIMITATIONS OF PRE-1978 LITERATURE

It is appropriate and useful to begin by reviewing the limitations of the early studies to see how well the more recent literature has performed in filling the gaps. Based on the Sloan-Feldman paper and thoughtful comments provided by Yett (1978) and Reinhardt (1978), the major drawbacks to pre-1978 work were:

(1) Inaccurate measurement of physician fees and area utilization;

(2) Inadequate consideration of nonprice competition;

(3) Incomplete adjustments for confounding demand and supply variables;

(4) Insufficient development of an alternative theoretical paradigm explaining demand inducement;

(5) Inadequate consideration of disequalizing forces in the physician services markets; and

(6) Insufficient analysis of backward-bending supply.

Limitation (1) covers a host of problems: (a) the use of physician self-reports rather than actual charges and services performed; (b) use of list rather than final transactions prices, adjusted for bad debts and reduced fees; (c) use of nominal charges, unadjusted for cost-of-living differences; and (d) use of counties, or other geographically circumscribed localities, to measure utilization rates, thereby ignoring the possibility of patient inter-area migration for care.

Limitation (2) reminds us that, as with all services, extensive nonprice competition occurs among physicians in the overall area of quality as well as in practice amenities such as shorter waiting times, auxilary staff attention, and time actually spent with the doctor.

Limitation (3) involves a host of difficult-to-measure factors, in addition to those potentially related to physician inducement, that could be affecting demand. This includes such factors as expanding insurance coverage, changing health status and attitudes, increased threat of malpractice suits, and technical change.

Limitation (4) reflects a legitimate concern of neoclassicists that demand creation is not so much a theory as an *ex post* rationalization of perverse relationships among physician prices, earnings, workloads, and supplies; that a formal set of assumptions, behaviors, and internally

consistent predictions are required before the inducement paradigm can be considered a true alternative to traditional demand/supply models.

Limitation (5) argues that nearly all previous studies have assumed observed prices and quantities to be the result of single-period equilibria when, in fact, prices may be inflexible to rapidly changing market forces, resulting in significant gaps between demand and supply *ex ante* and long-term adjustments.

Finally, limitation (6) points out the inadequate attention given to the possibility that backward-bending supply, which is part-and-parcel of a target income theory, may explain many of the noncompetitive findings of previous studies, without resort to demand inducement.

B. TRENDS IN THE INDUCEMENT LITERATURE SINCE 1977

Cursory review of the post-1977 literature shows at least twenty to thirty substantive papers addressing the general topic of physician inducement in one way or another (not counting a correlative literature on hospital utilization). Many of the pioneers remain active in the field, while neophytes also have joined the search, trying to improve both theory and methods. It is beyond the scope of this effort to conduct an exhaustive review of the new material similar to what either Sloan-Feldman or Juba have previously done. Instead, we have selected a few exemplary contributions that we think shed light on important aspects of the problem. Brief synopses of these are presented below. A more complete, but certainly not exhaustive, bibliography is included in the list of references.

The 1978 Supplement to the Journal of Human Resources included many excellent articles on physician behavior, two of which were directly on the subject of inducement. Fuchs (1978), extending his earlier work on the subject, explored the relationship between area surgery rates, physician prices, and physician supplies. Several new improvements were made over earlier work, including: (a) recognition of inter-area movement for care (i.e., physicians acting as magnets, attracting patients from underserved areas); (b) treating physician supply as endogeneous and testing for a feedback effect of prices on physician location; (c) deflating fees for area cost-of-living; and (d) testing the inducement effect for different educational groups.

Health Interview Survey data for 1963 and 1970 were aggregated to 22 regional/metro areas, adjusted for bordercrossing, and then were used to estimate a two-stage model, where physician supplies were predicted in a first stage, and the predicted supply value used to estimate structural demand equations. Findings supported the inducement hypothesis in a dramatic way, both in terms of surgery rates (an extra surgeon in an area added 40-60 operations per year) and in terms of fees (a positive supply elasticity of .5). The inducement effect also appeared to be larger where education was lower and resulted in higher volumes of less urgent kinds of operations.

While the Fuchs study has been criticized and improved upon in a number of ways, its findings still stand as prima facie evidence of market failure -- at least for surgery -- and are difficult to explain away.

Green (1978) presents a very different approach to the inducement question, although he uses Fuchs' (earlier) data to test his model. Primary focus is given to the relative impacts that physician supplies and patient income should have on physician workloads and fees under a monopolistically competitive regime. Assuming that demand is iso-elastic with respect to both supplies and income, the author -- using very terse, comparative statics methods -- shows that, without inducement, the relative impact of each should be the same on workloads and fees. Using Fuchs' data, he tests this proposition, and although the relative coefficients are very different in appearance, a statistical test proves inconclusive. If demand is assumed to be linear in supplies and fees (and therefore not iso-elastic) the discrepancy in relative impacts is further reduced. The lack of estimation details and the imprecision of the test-of-discrepancy make it difficult to put great weight in these findings as anti-inducement evidence.

In the last section of Green's paper, he considers the possibility of market disequilibrium, a problem generally ignored after Feldstein's (1971) classic attempt in the early 1970s. Green argues against Feldstein's simplifying assumption that observed utilization is determined by the "short-side" -- viz., demand-determined for prices above equilibrium, and supply-determined for below-equilibrium prices. Essentially, if prices are below equilibrium, physicians may attempt to fill part of the excess demand gap by working harder, filling more of the gap when it's larger and creating a positive correlation between supply and price. Under this scenario, simplistic equilibrium models may ascribe higher fees in physician-rich areas to inducement rather than to a

"generosity" motive in physician-scarce areas. (Yett, 1978, made the identical point, albeit in a very different way, in his review of the Sloan-Feldman 1978 review of the literature.) Green's paper suggests that a stronger test of inducement would come from a segmenting of markets into above- and below-equilibrium, and seeing if a positive correlation between supplies and prices occurs in both regions. There should be no plausible reason for greater output, holding price constant, in areas of excess supply.

This suggestion is taken up in a subsequent study by Mitchell and Cromwell (1980). Following the lead of Fuchs, the authors put together a continuous, eight-year data base (1969-76) of HIS responses for some 350 counties or Standard Metropolitan Statistical Areas (SMSAs). Both equilibrium and disequilibrium models were tested using simultaneous equation techniques; price, quantity, workloads, and location all were considered endogenous. Surgery rates were further decomposed into total versus elective, the latter presumably more inducible.

Holding insurance, health status, income, and other variables constant, the authors found positive utilization elasticities for surgeon supplies: (.1 for total surgery and .13 for elective surgery) as well as on price (.36). Reduced-form price elasticity with respect to supplies turned out to be much higher than short-run elasticities, which suggests a counter-theoretical equilibrating process. Since evidence, both anecedotal and otherwise (see Vahovich, 1977), is fairly strong on backward-bending physician supply, the authors considered this possibility in rationalizing their findings. Surgeons in large SMSAs were, in fact, found to have surgical workloads that fell as fees rose.

Backward-bending supply coefficients derived from cross-sectional data could be an artifact of market disequibrium, however, as surgery rates are supply constrained in surgeon-scarce areas. The authors segmented their 350 areas into high and low supply regimes and reestimated their model. In physician-scarce areas, surgery rates were dominated by supplies, as expected (health status also had an effect but no income variables). Nevertheless, even in surgery-rich areas, supply still showed a positive effect on fees, although the effect was reduced (slightly) from the pooled results. The authors conclude that "the usual competitive mechanism of price adjustments to eliminate demand-supply gaps appears strangely altered, if not altogether missing, in the market for surgical services" (p. 19).

Stano (1978) also considers the possibility of disequilibrium and discrepancies between ex ante and ex post demands and supply. What may be a disequilibrium transaction curve, the author claims, could be wrongly interpreted as an ex ante demand curve with inducement, if prices were inflexible. Stano assumes prices are rigid downwards due to collusion and/or collective actions of physicians who dominate insurer groups like Blue Shield. Fees in certain instances may be below equilibrium, but rigid upwards, if physicians in shortage areas are hesitant to raise fees out of charitable motives, fear of regulation, or the desire to maintain patient queues.

Using Fuchs and Kramer (1972) data, Stano estimates a five equation model with utilization, average price, and insurance coverage as endogenous variables. Two stage least squares methods are used. The results show a significant positive inducement effect, although only when

per capita income is dropped. Workloads also are shown to have a negative effect on prices, implying that physicians raise prices to offset falling demand.

The Bureau of Health Manpower (BHM/HRA/U.S. DHHS) has published a collection of excellent articles, The Target Income Hypotheses (1980), all of which are essential reading on the subject. Only a few that are most notable for content or approach relative to present purposes are reviewed here, but all are worth reading.

Ramsey (1980) provides a concise review of the physician behavioral literature on inducement, beginning with Feldstein (1971), and then goes on to discuss criteria relevant to a theoretical and empirical evaluation of competing standard neoclassical and inducement models. These criteria are presented as:

- o internal consistency, regarding sub-hypotheses;
- o external consistency, requiring that extensions of the original model are consistant with hypotheses;
- o generality, requiring that a preferred model explains more observed phenomena;
- o preciseness, particularly regarding the number of refutable hypotheses and the sign and magnitude of the predictions;
- o phenomenality, i.e., ability to be tested with observed data; and
- o empirical dominance, requiring superior verification rates on a battery of tests.

Using these criteria, Ramsey develops a profit-maximizing model of physician behavior in variance to Reinhardt (1972), assuming physicians will hire other physicians or sell their own time in order to maximize practice profits along with physician utility. This assumes, of course, no distaste for management or salaried employment which are key to Reinhardt's theory.

The author then examines two forms of the inducement model, following the lead of Sloan and Feldman (1978), and rejects them both on several theoretical and empirical grounds. Primary among his arguements is the failure of pure inducement or target income models to explain positive correlations between supply, prices, and utilization which might already be explained by the standard model, adjusting for non-price competition and short-run response lags.

The last section of the paper addresses important estimation issues like identifiability of the demand function, omitted variables like technical change, intertemporal and cross-sectional variations in specialization which systematically affect prices, uneven insurance coverage, and migration for care.

Pauly and Satterthwaite (1980) present a competing theory to explain the positive correlation between physician fees and supplies, one they call the "increasing monopoly" model. The increasing monopoly enjoyed by the physician is hypothesized to derive from the growth in practitioners relative to patients (or more specifically, geographic area), which reduces patient information about any single alternative physician and ties them more securely to their current physician. Under this unusual hypothesis, demand would become less, rather than more, elastic with

growing supply, which is strictly counter to the standard monopolistically competitive model.

The authors then specify a six-equation model and test the inducement/increasing monopoly models, using 1973 American Medical Association (AMA) fee and census data on primary care physicians in the 100 largest SMSAs. A two stage least squares method is used with physicians per square mile, female-headed households, and housing turnover rates used to proxy the lack of consumer information. The results strongly support the increasing monopoly model over the target income/inducement model, except when controlling for cost-of-living. Primary care physicians per capita, which was positively related to equilibrium prices before informational proxies were included, turned negative when variables like physicians per square mile were added. Mitchell and Cromwell (1980) were not able to reproduce these results for surgeons, however, suggesting that the focus on primary care may explain the reversal of coefficients (see Sloan, 1981).

From a policy standpoint, there seems to be little difference between the increasing monopoly and inducement models. Physician maldistribution exacerbates fee inflation in either case. The authors emphasize, however, that a focus on improved consumer information on physician fees and quality may have definite cost-reducing payoffs if their model proves correct. They are admittedly silent, on the other hand, in how to accomplish this.

Held and Manheim (1980) provide a fascinating look into the inducement question from a very different perspective than all other empirical studies. Based on medical claims data from the Province of

Quebec for 1971-75, they were able to test the relationship between physician supply, utilization rates, and costs for the treatment of a single diagnosis (specifically, essential benign hypertension). Casemix variation is automatically controlled for under this method, and illness severity cannot be used to explain higher prices in physician-dense areas. Moreover, because Canada has complete health insurance coverage, systematic variations between gross and net prices do not exist to confound interpretation of the inducement effect.

Descriptive statistics showed little variation in office visits and costs per year in treating hypertension across income and location. Treatment costs per patient-year rose about 10 percent annually, although office visits per year were relatively constant. What is observed is a rapid shift from less to more complex visits: in 1971-72, complex exams comprised 9.5 percent of all hypertension exams; but by 1974-75, the percentage was 27.7 percent. The implication of this finding is that physicians can, and may in fact choose to, upgrade (either in fact or on paper) the nature of the visit in order to justify a higher reimbursement. This behavior can be considered insurer-motivated inducement.

The authors then estimate three quasi-reduced-form equations for total hypertension costs, office visits, and office visits plus consultations for 13,000 hypertension beneficiary-years (i.e., several thousand patients over four years). Beside concentrating on a single diagnosis, the authors went through considerable effort to econometrically control for secondary diagnoses like heart disease and hypertension. Variables are stepped in groups to isolate marginal effects, which is very illuminating. For example, both specialists and GPs per capita are

positively related to treatment costs per year, ceteris paribus, although specialists/population ratios are negatively related to visits and consultations. When variables like the number of consultations are included (as exogenous, although they should be simultaneously determined), however, the specialist supply effect on costs also turns negative. Although the authors offer no explanation for the very large effect consultations have on costs ($41.75 per consult), it would appear that all of the positive specialist effect on costs is coming through referrals. Although total visits are thereby reduced, costs are higher in specialist-rich areas of the province because of the relatively high cost of consultations.

Another conclusion of the authors implies that the inducement effect, even if positive, "is not as serious as one might at first suppose," because of the low elasticities. Viewed another way, their results hold out little hope for growing physician supplies stemming cost inflation through competition.

Yett et al. (1980), in a methodological tour-de-force, develop the basic two-market physician demand model for private indemnity and UCR patients, seen elsewhere in the literature (Sloan, et al., 1978; Paringer, 1980; Mitchell and Cromwell, 1981). The model explicitly considers the possibility of segmented private and public (i.e., UCR) demand, giving estimable structural demand and profit-maximizing optimality equations for perfect and monopolistic competitors. The model also considers the possibilities that UCR-participating physicians raise charges to increase the next period's allowable charge, and that physicians employ markup pricing.

Claims data on a limited panel of 200-300 physicians in two Blue Shield Plans over four years are used to estimate the simultaneous model. Two stage least square estimation techniques are employed, with a dummy variable for each physician (making it a fixed-effect model) to capture unobserved information on non-Blue Shield output and practice characteristics (e.g., length of office visit). A fixed-effects approach to the unobserved amenities-cum-output problem works a unique departure from other work.

The results shed light on many interesting aspects of physician revenue and cost behavior (e.g., marginal cost was found to be negatively sloped). Demand was found to be quite price elastic, indicative of a monopolistically competitive market and implying that practitioners must consider (or are affected by) the pricing behavior of other physicians. Little evidence was found supporting an inducement effect among UCR-participants; however, a significant, positive correlation was found between physician supply and demand for nonparticipants in one of the two plans. Several specifications of the UCR-inflation-in-fees relationship provided some evidence that physicians manipulate future allowables through current fees, although the reaction function may be more complex than in Hadley and Lee (1978).

Although the data for their analysis were limited to just two areas and a few physicians, Yett et al. make several important theoretical and econometric contributions to the literature. Unfortunately, advanced economic training is required in order to take full advantage of this paper.

Lee and Hadley (1981) have taken the simpler insurance-adjusted demand models a major step further by specifying a sophisticated, multiperiod physician profit-maximization model that explicitly incorporates incentive to inflate current list fees to raise future Medicare (and other) payments. It may well be in the physician's best interest to keep current fees artifically high to assure maximum insurance reimbursement under UCR methods. Medicare and Medicaid claims data for 1,750 GPs, surgeons, and internists for the 1972-75 period are used to test this and other policy actions relevant to physician fee inflation, including the inducement effect.

Many of the author's findings pose serious questions for public policy. First, both surgeons and internists were found to raise prices when the growth in Medicare/Medicaid reasonable payments was slower. Second, while physician supplies proved to be negatively related to prices (an anti-inducement finding), the effects were very low (about .05 percent). Little reliance, they conclude, can be placed on competition to control burgeoning public budgets. And third, broad physician price controls, as experienced in the 1971-74 period, did slow the growth in prices. This was accomplished without serious physician withdrawal from Medicare/Medicaid because all insurer payments were being limited simultaneously.

Taken as a whole, this paper speaks strongly against the role of unbridled competition in limiting physician expenditures. This is particularly true if Medicare and Medicaid continue to: (a) allow physicians to price discriminate, charging what the various insurers are

willing to pay, and (b) reimburse them based on list charges rather than a more controlled basis.

In a very recent effort, Sloan (1981) estimated reduced-form fee equations with physician supplies as one explanatory variable. This effort was exceptional in that seven individual fees were used (office visit, hospital visit, two exams, and three surgical procedures) instead of just one; and an index of medical school distinction was included, along with variables for practice size and incorporated status and several indicators of practice costs, including the average malpractice premium. The data base for the estimation was the 1977-78 pooled HCFA/NORC physician survey, giving roughly 5,850 observations (less for the individual procedures). All specialties were pooled, with the physician-population ratio defined for the relevant specialty. Insurance coverage is based entirely on survey responses, with a predicted weighted fee schedule derived from first-stage regressions.

Physician supply coefficients were uniformly negative and usually statistically significant in the fee equations. The results are somewhat sensitive to the way in which insurance coverage is measured, but even so, they provided the strongest consistent support for competitively determined fees in the inducement literature. Except for the follow-up office visit, the elasticities were low -- on the order of .05 to .10. The office visit elasticity, on the other hand, implied a 4.4 percent decline in fees for every 10 percent increase in physicians per capita. Elasticities fall dramatically, however, when feedback effects of prices on physician location are taken into account.

Other explanatory variables of interest relative to fees included insurance coverage (elasticities = .25), malpractice premiums (elasticity = .10), and physician age, which showed high (or higher) fees for the youngest physician cohorts, even holding credentials, specialty, location, and quality of medical school constant. This result Sloan attributes, in part, to UCR methods that penalize older physicians who established fee profiles under uninsured regimes.

Auster and Oaxaca (1981) make a valuable contribution to the econometric literature on demand inducement by drawing out the implications of various model specifications on identification of the supply-induced demand (SID) effects. Inclusion of relative physician supply (i.e., physicians per capita) in a demand equation, the author's argue, can result in an estimable (identifiable) inducement coefficient only if output, or visits, are produced under various combinations of physician time and other inputs; otherwise output is tautologically related to supply (e.g., doubling the number of physicians leads to a doubling of output). Moreover, if multiple input production functions are the case, then there must be substantial inter-area variation in input price ratios to assure significant variation in input combinations and visits per physician. The authors then calculate coefficients of variation for several medical and other clerical wages and employment ratios for 22 SMSAs. In this, they find relatively little variation, pointing to the econometric difficulties in statistically identifying an inducement effect from cross-sectional data.

Auster and Oaxaca also point out that price and income coefficients derived from estimating conventional equations could also be interpreted

as inferential evidence of inducement. Neoclassical theory permits price and income to have negative and positive signs, respectively, when regressed on quantity; this is the usual case. Positive coefficients for both price and income, however, would imply that medical care were a Giffen good, like potatoes, which is difficult to accept. In this case, high inducement elasticities could explain such a finding.

C. SUMMARY OF MAJOR CONTRIBUTIONS

It should be obvious, even from these relatively few papers, that considerable effort has been devoted to redressing the major limitations found in previous work. The major recent contributions are summarized below.

First, many different data sources have been used to measure price and quantity besides physician surveys, including household interviews and insurer claims. The latter are particularly useful as they should reflect actual charges and procedures performed in an unbiased manner.

Second, it has become more-or-less standard to deflate charges for cost-of-living differences, making real prices comparable across physician markets (as well as implicitly adjusting for the effects of unobserved area demand factors).

Third, many different approaches have been used to address the patient migration, or bordercrossing, problems. These include a focus on large SMSAs, grouping of smaller counties into larger market areas, and econometrically adjusting for physician supply in contiguous markets.

Fourth, several attempts have been made to adjust for quality and amenity differences in charges, either explicitly through hedonic fee equations a la Sloan (1980-81) and Feldman (1979, 1980), or implicitly through econometric estimation (Yett et al., 1980) using physician-specific dummy variables.

Fifth, much more attention has been given to unobserved, or difficult-to-measure variables in the demand equation -- variables like the breadth and depth of insurance coverage. Use of Blue Shield and Medicare claims data have made a considerable contribution here as well, although very few studies have had access to them.

Sixth, a great deal of new theoretical work on the topic of physician markets and competition has been completed, further elucidating the direct and indirect forces acting on individual practitioners. Much of this work has been very much in the neoclassical vein, however, essentially as modifications of the standard model (e.g., Pauly-Satterthwaite's "increasing monopoly" model).

Seventh, a select few studies have considered dynamic disequilibrium conditions, either for private charges and physician location (as in Mitchell and Cromwell, 1980, and Stano, 1980), or in trying to influence future Medicare and Blue Shield allowables (as in Yett, 1980, and Lee and Hadley, 1981).

Finally, some consideration has been given to the implications of backward bending supply -- primarily in theoretical elaborations of the target income model (as in Sweeney, 1979, and Mitchell and Cromwell, 1980).

D. ASSESSMENT OF RECENT ADVANCES

Extensive as the new literature is, in theory as well as in practice, it is safe to say that both the orthodox and inducement theories continue to claim many adherents. Proving beyond a shadow of a doubt that physicians can and do shift demand under competitive pressures, as Feldstein and Evans thought they had done, has been frustrating to those imbued with the "flawed agency" paradigm of the physician-patient relationship. Neoclassicists have been similarly frustrated by their failure to convert demand creationists based on either comparative statics mathematics or negative, reduced-form price elasticities of supply.

In spite of these frustrations and disappointments, this work has not been without reward, for important and policy-relevant by-products have been spun off from this philosophical and quantitative competition. At the risk of oversimplifying, and possibly also of incurring the wrath of overlooked or misinterpreted contributors to the field, the following inferences may be drawn from the literature, recognizing that many do not specifically pertain to demand creation, but rather to more mundane matters:

(1) Almost universal agreement now exists among investigators that physicians exert some limited monopoly powers. By this is meant that individual physicians are price setters for the most part and that charging above-average fees does not result in dramatic losses in patients.

(2) While physicians do compete in terms of quality and amenities as well as price, nonprice competition alone explains relatively little of the observed variation in fees.

(3) Health insurance in general adds significantly to the demand for physician services, probably beyond medically necessary levels. Moreover, the widespread use of UCR and CPR reimbursement methods encourages physicians to artifically raise prices to third parties such as Medicare.

(4) If price competition does exist among physicians, it is most greatly felt by general practitioners. Specialist markets appear to be much less exposed to competitive demand forces -- in part because of better insurance coverage for their services. Scarcity may also explain their insulated position although general surgeons are a notable exception.

(5) Greater physician supplies, having only a minimal depressing effect (if at all) on charges, will likely result in continued rapid growth in public and private outlays on their services, particularly with the phasing out of general practitioners, whose fees are lower and who provide much of the preventive medicine.

(6) As physicians become increasingly specialized, there will be a tendency to increased consultations, which add to the cost of care and reduce continuity, albeit along with some (unknown) improvement in quality.

(7) A significant part of the attempt to defend the role of competition, or to deny creationist paradigms, has fallen back on semantics or on repairable flaws in the competitive system. Demand creation, for example, would not necessarily exist if physicians provided care of zero medical value so long as patients (or their insurers) are willing to pay for it. Or competition exists if greater physician supplies lead to lower prices, even if the declines are miniscule. Or greater supplies lead to less consumer information on price-quality variation, allowing the physician more monopoly power -- not less as would be expected under standard monopolistically competitive models.

E. THE ROLE OF THE PENNSYLVANIA BLUE SHIELD STUDY

The current study is a further attempt to verify or refute physician discretionary powers over demand by making certain modest contributions. It resembles most the two or three efforts that have used insurance claims

data (e.g., Yett et al., 1980; Lee and Hadley, 1981). Emphasis has been given to deriving price and output measures that truly reflect actual (as opposed to reported) charges for a broad mix of services, not just a single visit. Furthermore, by using a large sample of all physicians in one state, with price-output data covering six years, 1973-78, unique sub-analyses were possible. Fee equations for tonsillectomies, Colles fractures, and other surgical procedures were possible unlike any other study. Excellent data on demand, supply, and insurance were also available on a micro-level. It is hoped that these refinements and the attention to variable measurement and specification, as discussed below, will be considered an important contribution to the field.

III. ANALYTIC FRAMEWORK

A. GENERAL THEORY OF DEMAND CREATION

The issue of physician-induced demand can be analyzed most simply in terms of supply and demand. Much confusion exists between "price induced" and "supply (or physician) induced" increases in utilization. Figure 1 depicts the total demand (D) for and Supply (S) of some type of physician service (e.g., office visits, operations) in a market area. Each curve represents the horizontal summation of individual physician demand and supply curves.[1] If area population increased, total demand would area shift to the right. The same would happen to supply with an influx of physicians. Demand is downward-sloping, indicating that patients will use more physician services at lower prices. Supply is positively sloped as physicians are hypothesized to be willing to supply more services (e.g., office visits) at higher prices. Given demand, D_0, and supply, S_0, competition should lead to a market equilibrium at point A with price P_e and utilization rate Q_e (e.g., office visits per 100,000 population in the area).

An increased number of physicians in an area, holding population constant, would shift out supply (i.e., $MDPOP_1 > MDPOP_0$). If demand were unchanged, price should fall along the demand schedule to a new equilibrium at B with P_1 and Q_1. Thus, we should observe a positive

---

1. Whether there is such a thing as physician supply curves in a monopolistic market is arguable, a point we return to later. On this point, see in particular, Yett (1980).

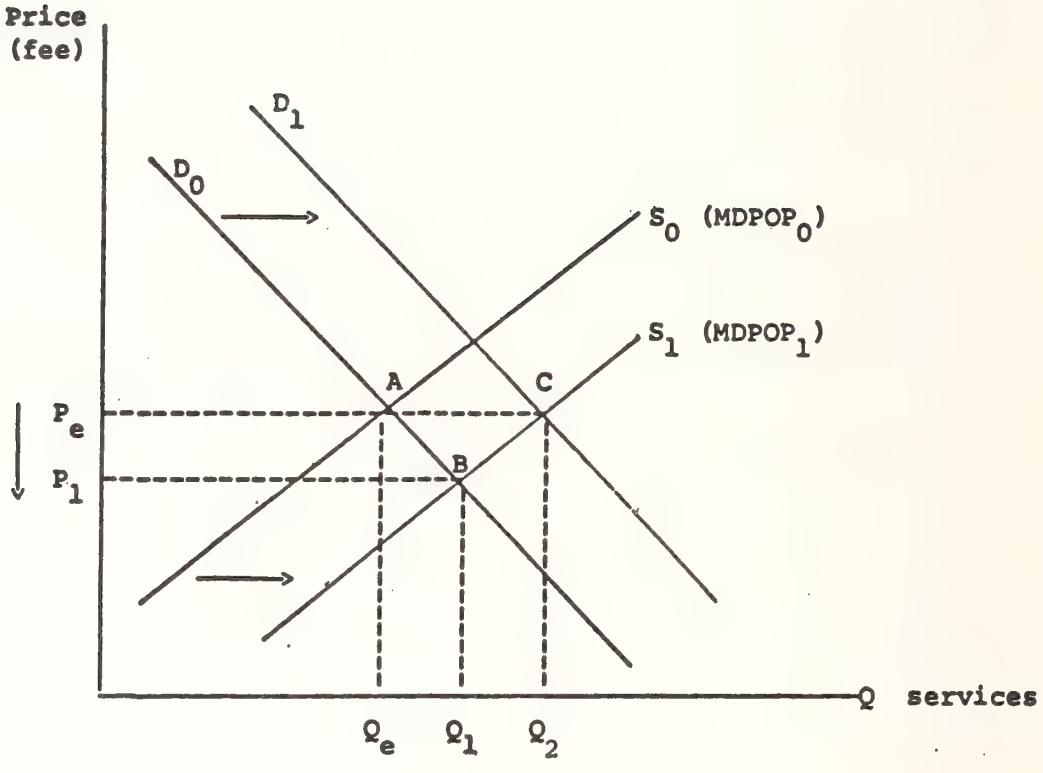


FIGURE 1

A Simple Model of Demand Creation

correlation between the physician-population ratio (MDPOP) and the utilization rate, Q, but this is due to price inducement alone. No physician inducement has occurred. But if providers, singly or jointly, are dissatisfied with the new price, P_1, they may shift the entire demand curve outward, provided they have the economic power to do so. If demand were shifted to D_1, say, the price would not fall but would remain at P_e. Quantity, however, would increase even further to Q_2. In this case we would observe no correlation between price and MDPOP and a very strong positive correlation between utilization and MDPOP. The quantity, $Q_2 - Q_1$, reflects the increase in utilization due solely to physician inducement while $Q_1 - Q_e$ represents "legitimate" price induced output.

The trick is to somehow tell whether we are observing point B or point C when physician supply varies spatially or intertemporally. In fact this would be relatively easy by simply comparing price-quantity changes. If prices are unchanged and quantity increases, shifting must have occurred, holding all other demand and supply variables constant, a caveat we return to in a moment. What complicates the analysis is that inducement, if it exists, may not leave equilibrium price unchanged. We could be observing price-quantity combinations anywhere above point B, depending on where the induced demand curve intersected supply. If this is between B and C, then we observe lower prices and higher quantities, an observation fully consistent with the no inducement hypothesis. Only if equilibrium came above C, with higher prices, would we be certain of inducement.[2]

---

2. For a formal mathematical proof, see Reinhardt (1978).

Or would we? Demand and supply are functions of price and a number of other variables, all of which must be held constant for our simple conclusions to hold. If MDPOP is correlated with other exogenous demand or supply variables, any discovered inducement effects may be wrongly ascribed to differences in MDPOP. Suppose, for example, that physicians tended to locate in wealthier areas. If higher income leads to a greater demand for physicians' services, then D_1 would not necessarily reflect inducement: physicians would only be responding to a stronger demand. To determine whether the intersection of demand and supply includes any inducement, we must be able to hold all relevant demand and supply factors constant, then look at prices. If prices go up as MDPOP rises, then this is strong prima facie evidence of inducement. Looking at utilization is trickier because changes in Q include both legitimate price and illegitimate nonprice influences. We would have to have further information on any price changes before "proving" the existence of demand inducement from utilization changes. In fact, prices and all other exogenous factors would have to remain unchanged for quantity (per capita) increases to categorically support the inducement hypothesis (represented by a movement from A to C in Figure 1). Even a small price decline could explain all of the utilization increase if demand were highly price elastic, an admittedly unlikely proposition but one that cannot be dismissed out-of-hand.

B. A PHYSICIAN-SPECIFIC INDUCEMENT MODEL

Our data base provides a wealth of information at the individual practice level, suggesting a respecification of the inducement theory with the physician as the unit of analysis. Demand, D_0, can be considered as the horizontal summation of individual physician demand in pro rata fashion, as shown in Figure 2. At any price, P_e, the monopolistically competitive quantity demanded, A, for the average physician, is equal to total market quantity, B, divided by MD, the number of physicians, i.e., $A = D/MD$ at P_e. (The analysis can also be expressed in per capita terms by simply dividing D and MD by area population.)

In the physician market we assume that individual physicians face downward-sloping demands rather than the perfectly competitive, horizontal demand, but peer competition does not allow each to set price and quantity as pure monopolists either. If, for example, a typical physician lowered his fee below P_e, he would "capture" more patients than predicted by a simple downward movement along his pro rata demand curve, D_0/MD (or the ratio of D_0/POP to MD/POP). Curve d_0 presumes that other physicians, of course, are not altering their prices, an unrealistic assumption. When others lower fees in response to a loss of patients, assuming no inducement for the moment, average prices fall and overall market demand does increase; not along d_0 for each physician, but along the pro rata demand curve. Eventually, d_0 shifts down and an equilibrium fee-quantity is found along each physician's pro rata demand that is also consistent with market demand. For simplicity, let us consider this point A.

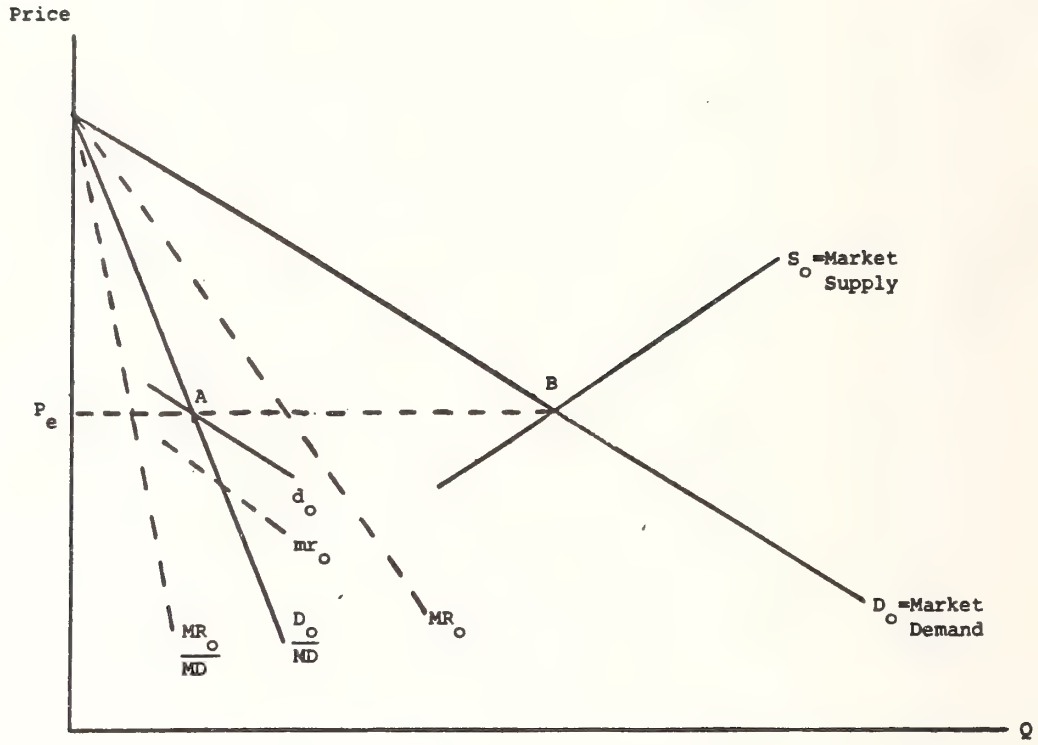


FIGURE 2

Monopolistically Competitive Model
of Physician Demand

Hence, the conclusion that prices are lower and output higher than under pure monopoly.

For a constant market demand, an influx of physicians should rotate pro rata demand inward and shift the more elastic d_0 curve downward (or inward) as well, as physicians (theoretically) react to increased competition and loss of patients by lowering fees.[3] Thus, we should expect a negative correlation between average physician fees and per capita supplies although workloads may well be greater (the aforementioned price-induced effect on output).

With inducement, the conclusions are not nearly so clear-cut. Individual physicians, unhappy with lower fees, may induce additional visits, operations, etc., thereby offsetting the inward rotation in demand. This has the effect of rotating aggregate demand outwards as well. Whether they are successful at completely offsetting natural competitive pressures on fees is an empirical question. If they are, then no inverse correlation would exist between supply (or number of practicing physicians) and average fees.

All of these arguments ignore factors other than the number of physicians in influencing demand. Clearly, any factor that influences demand or is correlated with physician supply must be held constant to avoid spurious correlations. Possible factors can be grouped into

---

3. Hirshleifer (1980) notes that more suppliers can result in an outward shift in market, and hence, pro rata demand due to greater consumer accessibility. This point is often made in the physician market in terms of lower time prices (Pauly, 1980). Yet, as Hirshleifer points out, the net change in pro rata demand still should be inward as the denominator, MDPOP, grows more rapidly than the numerator, per capita demand.

area-specific vs. physician-specific. Area-specific factors would include the usual demand variables like income and insurance coverage and proxies like unemployment rates, poverty families, and Medicare/Medicaid coverage. Also relevant would be proxies for medical need and use of medical inputs. Included in this category would be such things as schooling levels, degree of urbanization (to capture differences in accident rates, etc.), and demographic mix (under 5 years of age, over 65, percent female or minority).

Individual physician characteristics should also affect pro rata shares of aggregate demand. Board certified M.D.s, for example, should be able to command higher fees than less trained physicians. Specialists should also enjoy stronger demand than general practitioners. Physician age should exhibit an inverted U-shaped relationship with demand (or fees) as middle-aged physicians enjoy returns to greater experience which are eventually offset by skill obsolescence (both real and perceived). Finally, physicians as a group should charge higher fees when operating in more expensive labor markets.

C. STATIC AND DYNAMIC REDUCTIONS

Across physician market areas at any point in time, neoclassical theory predicts an inverse correlation between physician fees and supplies, ceteris paribus. This is certainly true under perfect competition and profit maximization and should also obtain under monopolistic competition as well. If physicians are utility maximizers, backward-bending supply curves are possible, with higher fees and much

less output per physician, but this behavior is antithetical to neoclassical, positively sloped supply curves. Furthermore, as utility maximizers, physicians should be less inclined to induce demand for services requiring more of their time, a fact pointed out by Reinhardt (1978). This leads to a more specific prediction that lab tests, EKGs, and other procedures requiring less physician input should be more inducible than surgical procedures and comprehensive hospital and office visits. In other words, the less involved the physician is in a direct way in providing a service, the more inducible it becomes in his eyes, and hence the less likely we should be to observe an inverse correlation between fees and physician supplies, ceteris paribus.

Dynamic predictions of inducement over time are less direct, as much depends on holding constant secular trends in demand and supply. In general, however, we would expect a slower rate of fee inflation in physician-dense areas because of greater price competition. While supply in such areas may be more price-inelastic so that intertemporal demand shifts result in higher-than-average fee inflation, no strong reason argues for this scenario, especially within specialty group for a particular procedure. If, on the other hand, physicians successfully induce demand for some procedures to keep up with inflation, then no inverse correlation between fee inflation and physician competition would be observed.

IV. PBS DATA BASE AND VARIABLE SPECIFICATION

A. LONGITUDINAL CLAIMS FILE

The basic data base for this study is taken from Pennsylvania Blue Shield files of submitted claims for physician services, aggregated and supplemented in certain ways to form a cross-section of time-series on individual physicians for the six-year period, 1973-1978. As these files include literally millions of separate claims per year, various criteria were used in abstracting the data to produce manageable analytic files. The physician-year was the unit of analysis, giving 48,594 observations in toto, 8,099 physicians for each of six years.

B. SCOPE AND CRITERIA FOR INCLUSION

The sample of physicians and claims was limited following a two step procedure. First, as part of a related cross-sectional study, a list of 44 regular Blue Shield business and 33 Medicare Part B procedures had been chosen for examination and all claims pertaining to these procedures were aggregated by physician for 1975. This list accounted for roughly one-half of all Blue Shield services and over 70 percent of all Medicare services. To insure stable estimates of charges and utilization, physicians were required to have submitted at least ten claims for a particular procedure during the year or else all their claims data were dropped, but only for that procedure subfile.

Using the 1975 physician sample as a starting point, longitudinal files were constructed by physician for each of 23 procedures (described in detail below) by adding claims for the years 1973, 74, 76, 77 and 78. If, for a given procedure, the physician did not bill at least once during each and every year before and after 1975, he was dropped. This insured a sample of established physicians with continuous billing over the six year period, with at least ten claims submitted for a given procedure in 1975.

Because some physicians do not perform certain procedures, or at least not often enough to meet the above criteria, the physician sample varies by procedure (Table 5-1), from a high of 5,564 for brief office visit to a low of 30 for laminotomy (herniated disc). This selection process resulted in 8,099 unique physicians across the 23 procedures.

Due to difficulties in matching demographic data for practice locations which change from year to year, physicians who moved across counties during the six-year period or who perform different procedures in different counties were dropped. This reduced the sample of physicians represented in any procedure file by an additional 2.2 to 4.4 percent. All physicians remaining in the 23 procedure files practiced continuously in a single county for all six years.

C. ANALYTIC PROCEDURE AND SUMMARY FILES

Twenty-four analytic longitudinal files were constructed: 23 individual procedure files plus a summary file which aggregates charge and utilization information by physician across the 23 separate files. Each file contains basic physician charge and utilization information pertinent

TABLE 5-1. LONGITUDINAL STUDY FILES:
PROCEDURES, NUMBER OF PHYSICIANS, AND RELATIVE VALUES

	PHYSICIANS			
	Total	Regular Business	Medicare	Relative Value
Colles fracture, closed reduction	122	115	34	17.60
Tonsillectomy, child	133	133	0	16.51
Protosigmoidoscopy	781	649	598	3.17
Cholecystectomy	177	169	46	54.23
Herniorrhaphy, inguinal	216	168	112	34.88
Resection prostate, transurethal	148	60	146	68.32
D&C	224	223	5	15.84
Hysterectomy, total	207	207	2	60.12
Laminotomy for herniated disc	30	29	4	84.76
Excision of lens, unilateral	242	66	242	66.44
Delivery, vaginal, incl. pre/post	424	424	0	40.33
Chest X-ray, PA & lateral	304	247	257	2.51
Upper GI	141	120	110	5.30
Brief office visit	5564	29	5564	1.00
Intermediate office visit	3808	50	3791	1.28
Initial hospital visit with comprehensive workup	3196	2584	2670	4.60
Brief hospital visit	1955	1341	1644	1.08
Intermediate hospital visit	3005	2317	2635	1.46
EKG w/interpretation	2033	1709	1773	2.51
Urinalysis	1434	418	1378	0.41
Fasting blood sugar	1632	666	1582	0.56
Complete blood count	1134	627	1023	0.70
Comprehensive consultation	1823	1340	1611	5.31

to that procedure, viz., average median charge, number of times service was provided, plus other physician-specific and county-of-practice information (described below). Table 5-1 provides a list of the 23 procedures along with the number of physicians by line of business. The total number of physicians in any file is less than the sum of physicians in each of the two lines of business separately because of physicians who see both kinds of insured patients. Also, because the physician-year is the actual unit of observation, the total number of observations in any file is exactly six times the total number of physicians in the last column.

As may be imagined, many of these files are quite large. The brief office visit file, for example, has over 33,000 separate records, composed almost exclusively of physicians seeing Medicare patients (PBS does not cover this particular kind of visit). Many other visit categories have over 10,000 observations, including office visit (22,848), initial hospital visit (19,176), and intermediate hospital visit (18,030).

The 23 procedures chosen for longitudinal analysis form a subset of the 44 topic procedures selected for a parallel 1975 cross-sectional study. Criteria for procedure selection in the cross-sectional experience sample required that;

(1) procedure definition and description be unambiguous and generally accepted;

(2) enough observations exist to provide adequate sample sizes;

(3) when possible, the procedure be performed across a large number of specialties (not always the case);

(4) procedures be reasonably representative of the mix of service categories reported.

To these criteria was added a fifth that:

(5) procedures also represent a mix in terms of the physician's ability and willingness to induce demand.

Not all services are amenable to shifting. Initial office visits and a large number of surgical procedures are either of an emergency nature or are at the patient's initiation. As a result, any inducement effect can be overwhelmed by the majority of services which cannot be increased arbitrarily.

If one can make a priori predictions as to the services most conducive to shifting, then a sharper test of the inducement hypothesis is possible. Physicians produce a broad range of medical and surgical services. While surgery in general is presumably less amenable to demand inducement, certain surgical procedures like tonsillectomy, herniorrhaphy, and D&C tend to be more elective and thereby potentially more inducible. Fractures and obstetrical deliveries probably are at the opposite end of the spectrum and can be used as "controls" against which to compare surgical inducement. That is, if inducement exists, we should find a greater effect the more elective the surgery.

Other procedures can be similarly fitted along a discretionary continuum. Initial hospital visits, for example, should be less inducible than follow-up hospital visits which are more discretionary. Ancillary services of all kinds are likely to be highly inducible, particularly given the small amount of physician input involved (Reinhardt, 1978). Of the extensive list of possible choices, six ancillaries have been chosen: chest x-ray, upper GI series, EKG, urinalysis, blood sugar, and a complete

blood count. A comprehensive consultation was included to test for inducement effects through physician referrals.

The longitudinal summary file aggregates physician fee and utilization information across the individual procedures using relative charges and utilization as weights. Total procedure output per physician-year was calculated as the weighted sum of each of 23 services, the weights based on empirical pricing data from the 1975 PBS Medicare and Blue Shield claims experience. A mean billed charge per procedure was determined, then scaled to the average fee for a brief office visit. This RVU-like scale is provided in column (4), Table 5-1 above. Based on the relative prices, an upper GI series is valued at 5.3 times a brief office visit, an EKG, 2.51; a complete blood count, .7; while various surgical procedures range from 3.17 for a proctosigmoidoscopy to 84.76 for a laminotomy for a herniated disc. Using constant 1975 weights derived from the entire sample eliminates both physician and time effects on the prices weights.

A physician summary charge index was derived in a similar manner by multiplying median charge per procedure times frequency, giving an estimate of gross revenues, then dividing by weighted output. The resulting "price" reflects the average charge per RVU.

Quantity and price indexes were calculated, first, for Blue Shield and Medicare separately, then combined using physician relative output in the two programs as weights. Aggregated Blue Shield and Medicare Level I and II screens, payments, and participation rates were similarly indexed and weighted across the 23 procedures, putting all dollars and percents in RVU terms.

D. CHARGE, UTILIZATION, AND EXPLANATORY VARIABLES

Each of the 24 analytic files contains information on physician billings, utilization, and payments, plus physician-specific characteristics taken from the American Medical Directory and PBS provider files, and certain county characteristics having to do with patient demand and medical care supply. Table 5-2 provides a list of all variables on each file by category. Sources for all data can be found in PBS Research Report R-419-10 (October, 1979).

The FEE variable on the individual procedure files is the weighted average of Blue Shield and Medicare median charges, the weights being the relative number of line items billed to Blue Shield and Medicare. FEE and other charge, payment, and utilization variables were aggregated across the 23 procedure files in the summary file in the manner described in the previous section.

Deflation of fees, payments, and all other dollar variables on the files was done using an estimated county-level Consumer Price Index (CPI). County CPI figures do not exist and had to be estimated based on CPI data available for selected SMSAs. Using a specification provided by Gabel at HCFA, 1975 CPI data for eight regional SMSAs in, or proximate to, Pennsylvania (Baltimore, Buffalo, Cincinnati, Cleveland, Scranton, New York, Philadelphia, and Pittsburgh) were regressed on five predictors: population density, per capita income, median housing values, average rental rates, and percent of population living in urban areas. The resulting equation was then used to predict county-level CPIs based on county-specific information on the predictors. For 1975, the index

TABLE 5-2. CHARGE, PAYMENT, UTILIZATION, AND EXPLANATORY VARIABLES

Mnemonic	Category and Description
	Charge/Payments
FEE, AFFE	Average median charge, nominal and deflated by CPI
MDNCHG, MDNPAY	Blue Shield median charge, payment
MNLEV1, MNLEV2	Blue Shield Level I, Level II screens
PCTUCR	Pct. Blue Shield line items under UCR
MMDNCHG, MMDNPAY	Medicare median charge, payment
MMNLEVI, MMNLEV2	Medicare Level I (customary), II (prevailing) screens
PCTASN	Pct. Medicare line items assigned
CHGUCR, LIUCR, PAYUCR	Pct. of Blue Shield-plus-Medicare charges, line items, and payments under UCR
CHGASN, LIASN, ALLASN	Pct. of Blue Shield-plus-Medicare charges, line items, and payments assigned or billed as payment-in-full
BSTOTREV, MBTOTREV	Blue Shield, Medicare total revenues (payments)
	Utilization
TOTSVCS, MTOTSVCS, TOTS	Blue Shield, Medicare, and total services billed
BSPTS, MBPTS	Blue Shield, Medicare patients
UABS, URM, URT	Blue Shield, Medicare, and total patient utilization rate
	Metro/County Characteristics
POP	Total county population
POPURB, POPMINOR, POPFEM, POPLT5, POPGT65, POPPOV	Pct. of population living in urban areas, minority, female, under five years old, over age 65, and under poverty level
POPDENSE	Population density per square mile
SCHYRS	Median school years completed
WORKUNEM, WORKLAB	Pct. of workforce unemployed; pct. laborers
PCINC, ADJPCINC	Per capita income, nominal and deflated by CPI
HOSPBDS	Hospital beds per 100,000 population
PHYHOSP	Pct. of physicians hospital-based

TABLE 5-2. CHARGE, PAYMENT, UTILIZATION, AND EXPLANATORY VARIABLES

(Continued)

Mnemonic	Category and Description
	Metro/County Characteristics
PCTAREPR, MDSPER, SURGPER, GPPER	Direct patient care physicians, medical and surgical specialists, general practitioners per 100,000
METRODRS	Direct patient care physicians per 100,000 in metro area
PTCAREMI, PTCPERMI	Direct patient care physicians per 100 square miles, and per 100,000 per 100 square miles
DROFFWAG, ADJDRWAG	Average annual salary per physician employee, nominal and deflated by CPI
BSTOTPAY, MEDALLW, MEDASST	Total Blue Shield, Medicare payments in county, state medical payments per capita
ADJMEDAS, ADJMEDB	State medical assistance, Medicare payments per capita, deflated by CPI
CPI	County level consumer price index
RENT, HOUSE	Average housing rental rate, median housing value
	Physician Characteristics
DRNO	Unique physician number
COUNTY, ZIP, METRO	County, ZIP code, and metro area of practice
LOB	Line of business (Blue Shield, Medicare, both)
DEGREE	M.D. or D.O.
PBSSPEC, BRDSPEC	PBS self-designated specialty, broad specialty group
BOARD	Specialty certification (yes/no)
PROFSCHL	Medical School attended
AGE, YRSLIC	Physician age, number of years licensed (in 1975)
PARTSTAT	Blue Shield participation status

ranged from a low of 102 in rural Pike county to a high of 121 in Philadelphia, conforming fairly well to expectations of urban/rural cost-of-living differences. Because no time-series data were used in the original estimation, the index is essentially cross-sectional, except for any time-dependent changes in the predictors. The mean value of the index rose only three points (from 109 to 112) over six years. Hence any deflation of statistics using the index really only applies geographically and not intertemporally. In other words, trends over time in "deflated" fees do not reflect changes in real charges from one period to the next. This should not be a major problem for this study given the focus on geographic differences in fees, utilization, and physician competition.

Most of the charge, payment, and utilization variables in Table 5-2 are straightforward. The Level I and II screens reflect the two limits placed on individual physician charges under UCR reimbursement schemes: usual (Blue Shield) or customary (Medicare) for Level I; customary (Blue Shield) or prevailing (Medicare) for Level II. Utilization rates were calculated on a per patient basis by dividing total services provided by a physician by the total number of unique patients seen during the year. Thus, we have output per physician as well as utilization per patient.

Using the actual county of practice, physicians' data have been grouped into 13 METRO-NONMETRO areas to more properly reflect market areas and reduce the bordercrossing problem: Wilkes-Barre, Scranton, Altoona, Erie, Johnstown, Reading, Harrisburg, York, Lancaster, Allentown-Bethlehem-Easton, Pittsburgh, Philadelphia, and other (rural) counties. Physician-population and other county variables were then put on a metro area basis. Broad specialty group is an aggregation of 37 specific

individually represented specialties into the following four broad classes: general practitioners (including family practice), medical specialists, surgical specialists, other specialties.

E. STRENGTHS AND WEAKNESSES OF DATA BASE

The great strengths of our data base are its comprehensiveness and accuracy. All included physicians were in continuous practice across all six years. Utilization and fees are based on all claims submitted for a significant percentage of the physician's practice. The data are based on actual services and not physician self-reports, and have been adjusted for geographic differences in living and operating costs. A number of key physician descriptors have also been added to adjust for differences in the quality and type of care received. Finally, many county demand and supply variables have been merged in order to adjust for geographic differences in medical need and alternative sources of care.

Certain drawbacks exist, however, in testing for physician inducement. First, only data on the Blue Shield and Medicare portion of the physician's practice are available. If these two are relatively minor for a particular physician, then the estimated price and utilization rate statistics may not be representative. While for some physicians this may indeed be true, it is unlikely to be so for the bulk of our sample -- particularly given the minimum billing requirement of at least ten services in 1975. Second, no data exist on practice amenities, e.g., length of visit, waiting times, that can influence demand and bias our findings in favor of inducement. How important such variables really are

in physician pricing (and demand) is still debatable, however (see Sloan and Feldman, 1978; Sloan, September, 1979). Third, reported charges may not necessarily reflect final transaction prices. Physicians may not collect the full deductible and coinsurance from Blue Shield or Medicare patients. If their discounts and bad debts increase with competition, then stated prices will be systematically higher than transaction prices in physician-dense areas. It is not known how serious a problem this is.

V. DESCRIPTIVE FINDINGS

A. ORGANIZATION OF CHAPTER

Descriptive information on physicians' submitted charges, services, and payments are presented, first on an aggregated basis and then by individual procedure. All payment information has been deflated for geographic differences in costs-of-living, although no intertemporal deflator has been used due to the lack of a county-specific CPI on an annual basis. Utilization information is presented both on a per physician and a per patient seen basis, the latter reflecting intensity per beneficiary.

Much of the comparative data is displayed by low, medium, and high physician-population groups. Categorizing physicians by degree of area competition was done in two steps. First the 67 Pennsylvania counties were grouped into 13 metro areas, 12 urban and one rural, to reflect market areas and to reduce bordercrossing problems. Direct patient care physician-population ratios were then calculated for each area in 1975 and the areas designated high, medium, or low in roughly equal proportions. Thus, urban areas like Philadelphia with 241 physicians per 100,000 were categorized as high physician density, while all rural areas (with only 96 physicians per 100,000) were classified as low. This categorization, while only crudely approximating individual physician competitive markets, should allow some useful comparisons of a descriptive nature on the relation between fees, utilization, and competition.

B. PHYSICIAN WORKLOADS AND CHARGES BY GEOGRAPHIC AREA

Table 5-3 displays annual physician workloads, defined as weighted averages of 23 Blue Shield and Medicare services, along with weighted fees per RVU, first for the 13 metro/nonmetro areas, then by low, medium, and high physician/population (MDPOP) groupings. Metro areas are ranked by the number of direct patient care physicians per 100,000. The ranking is closely related to SMSA size, with Philadelphia, Harrisburg, and Pittsburgh at the top.

Average physician Blue Shield plus Medicare workloads in 1978 were 1,770 RVU units for the 23 procedures taken as a whole, up from 1,591 in 1973, an increase of 2.25 percent per annum. Average deflated fees per RVU were $8.60 in 1978, up from $5.92 in 1973, a growth rate of 9.1 per year, or four times as fast as workloads.

Holding Blue Shield and Medicare penetration constant, one would expect average workloads to fall with greater physician concentration as pro rata demand shifts in. This does not seem to be the case as can be seen at the bottom of the table. Workloads in low and high MDPOP areas are quite similar, yet 400 or so units less than for physicians in areas of medium physician concentration. Physicians practicing in the Pittsburgh, Reading, and Scranton metro areas have particularly high workloads given the relative supply of physicians. Blue Shield penetration clearly does vary by market area, however, giving widely different Blue Shield enrollees per physician (E/MD), as shown in the last column of Table 5-3. Reading, Scranton, and Wilkes-Barre all have

TABLE 5-3. AVERAGE PHYSICIAN BLUE SHIELD-PLUS-MEDICARE WORKLOADS AND FEES, DEFLATED, BY METRO AREA BY DEGREE OF PHYSICIAN CONCENTRATION

AREA	DIRECT PATIENT PER 100,000 CARE MDS	WTOTS				WAFEE				E/MD
		1973	1976	1978	ANNUAL % Δ	1973	1976	1978	ANNUAL % Δ	
ALL AREAS	170	1591	1863	1770	2.25%	5.92	7.46	8.60	9.1%	398
1. Philadelphia	241	1498	1748	1624	1.68	6.33	8.00	9.19	9.0	211
2. Harrisburg	174	1520	1807	1689	2.22	5.57	7.17	8.15	9.3	339
3. Pittsburgh	162	1952	2342	2241	2.96	5.73	7.13	8.33	9.1	395
4. Allentown-Beth-Easton	128	1590	1823	1710	1.51	5.66	7.24	8.41	9.7	578
5. Reading	128	1910	2179	2101	2.00	5.73	7.03	8.08	8.2	430
6. Altoona	111	1090	1452	1447	6.55	5.32	6.52	7.53	8.3	207
7. Scranton	111	1760	2110	1929	1.92	6.00	7.54	8.76	9.2	495
8. Erie	99	1063	1368	1308	4.61	5.64	7.37	8.48	10.1	485
9. Johnstown	99	2010	2097	2086	0.76	6.29	7.75	8.75	7.8	384
10. Lancaster	96	912	1099	1075	3.57	5.15	6.56	7.58	9.4	167
11. York	93	1050	1221	1234	3.50	5.50	6.91	7.97	9.0	430
12. Wilkes-Barre	91	1846	2180	2148	7.00	5.56	7.09	8.11	9.2	648
13. Rural	86	1567	1789	1756	2.41	5.58	6.97	8.07	8.9	407
LOW MDPOP	< 111	1482	1720	1680	2.67	5.60	7.04	8.13	9.0	
MEDIUM MDPOP	111 - 174	1826	2163	2060	2.56	5.70	7.15	8.30	9.1	
HIGH MDPOP	> 174	1498	1748	1624	1.68	6.33	8.00	9.19	9.0	

high numbers of enrollees per physician, explaining some of the workload differences. Yet, Pittsburgh, which shows very high physician workloads, does not exhibit a particularly high E/MD ratio.

Even after deflating by the cost-of-living, Philadelphia still exhibits the highest physician charge per RVU, $9.19 in 1978. In fact, deflated fees do appear to be positively correlated with physician concentration rather than the opposite. Many uncontrolled variables could explain this relationship, including specialty mix, insurance coverage, and demographics; yet the correlation is striking -- particularly after deflation and adjustments for more complex types of procedures. Trends in fees show no relationship to physician supplies either, rising 9.0 percent per year, suggesting that greater competition does not necessarily narrow differentials over time. Again, however, care must be taken in interpreting these figures due to the possibility of confounding variables.

C. CHARGES, UTILIZATION RATES, AND WORKLOADS BY PHYSICIAN CHARACTERISTIC

Table 5-4 next presents charges, utilization, and workloads for 1975 by selected physician characteristics for low, medium, and high physician density areas. Like the previous table, all statistics are taken from the longitudinal summary file which uses a relative value scale to aggregate charges and services across 23 procedures (as described in Section V.B above). For example, general practitioners practicing in low physician/population areas in 1975 produced 1,206 weighted Blue Shield and Medicare services at an average charge of $5.96 per RVU. They were paid

TABLE 5-4. WEIGHTED CHARGES, PAYMENTS, WORKLOADS, AND UTILIZATION RATES

BY PRACTICE CHARACTERISTIC BY PHYSICIAN DENSITY, 1975

PHYSICIAN CHARACTERISTIC	WTOTS			WURT			WAFEE			WAPAY		
	LO	MED	HI	LO	MED	HI	LO	MED	HI	LO	MED	HI
SPECIALTY												
GPs	1206	1116	1078	6.36	5.79	5.95	$5.96	$6.60	$6.54	$5.18	$5.26	$5.62
MED. SPEC.	2258	2310	1993	6.87	6.18	6.46	6.91	6.78	7.59	5.87	5.86	6.16
SURG. SPEC.	1473	1586	1294	4.91	4.66	4.27	6.88	7.01	7.95	5.81	5.92	6.26
OTHER SPEC.	1031	1727	1111	2.88	3.26	3.01	7.10	7.10	7.69	5.90	6.26	6.45
BOARD CERTIFIED												
NO	1285	1454	1252	6.18	6.02	6.15	6.24	6.34	6.83	5.41	5.53	5.80
YES	1909	1834	1654	5.35	4.73	4.80	6.94	6.92	7.92	5.79	5.86	6.26
LINE OF BUSINESS												
BS ONLY	1556	1529	850	6.39	5.70	5.57	7.01	6.43	7.35	5.95	5.50	5.46
MEDICARE ONLY	584	550	588	4.33	4.12	4.20	6.55	6.85	7.36	5.58	5.93	6.29
BS & MEDICARE	2473	3277	2629	6.88	6.37	6.36	6.41	6.52	7.43	5.50	5.58	5.93
MD AGE												
27 - 42	1647	1694	1489	5.52	5.10	4.97	6.98	6.99	7.72	5.95	5.99	6.22
43 - 49	1824	1951	1568	6.08	5.40	5.57	6.49	6.74	7.54	5.50	5.68	6.10
50 - 56	1615	1832	1583	5.88	5.49	5.41	6.49	6.58	7.46	5.52	5.64	6.00
57 - 63	1466	1594	1352	5.99	5.65	5.48	6.31	6.32	7.17	5.44	5.55	5.87
64 +	979	1014	1242	6.00	5.48	6.10	6.13	6.37	6.88	5.30	5.55	5.90
AVERAGE	1495	1627	1448	5.90	5.44	5.49	6.48	6.60	7.36	5.54	5.68	6.02

NOTES:

WTOTS = Weighted Total Services per physician
WURT = Weighted Utilization Rate per patient seen
WAFEE = Average Total Charge per RVU, COL deflated
WAPAY = Average Blue Shield or Medicare payment per RVU, COL deflated

about 13 percent less, or $5.18 per weighted unit of service. Weighted utilization per patient seen was 6.36 units of service, or slightly over six brief office visits per year. It should be remembered, however, that Blue Shield does not generally cover brief office visits, which results in a significantly lower estimate of actual physician workloads and a corresponding upward estimate of the intensity of care per patient seen. To reduce biases this might introduce, comparisons are made by specialty and line of business (LOB) as well.

Medical specialists clearly have the highest average Blue Shield/ Medicare workloads -- nearly double those of general practitioners. This is primarily due to the greater number of ancillaries billed for and the more complex visit mix. GPs, moreover, rely more heavily on brief office visits which Blue Shield usually does not cover. Surgical specialists are only 20-30 percent more productive than GPs, which is somewhat surprising considering the higher proportion of more intensive surgical procedures covered by Blue Shield. (A herniorrhaphy, for example, is "worth" 35 brief office visits.) Board certified physicians also bill for more services, which is consistent with the lower workloads of non-certified GPs. Physicians seeing both Blue Shield and Medicare patients naturally bill at much higher levels. That Blue Shield-only physicians have considerably higher workloads than Medicare-only physicians can be explained by inclusion of OB-GYNs in the former and the greater number of Blue Shield patients in any market area. Finally, Blue Shield/Medicare workloads follow an inverted U-shaped pattern with physician age, or with physician work experience, peaking between the ages of 43 and 49 and falling thereafter.

No monotonic relationship is found between Blue Shield/Medicare workloads and physician density either. Overall workloads are 1,495 RVUs in low MDPOP areas, rising to 1,627 in areas of medium competition, and then actually falling again in high density areas. This pattern is generally consistent within specialty group, except for GPs where workloads uniformly decline with more direct patient care physicians. This again could be due to a systematic variation in Blue Shield market penetration.

Turning to charges and payments, surgeons and "other" specialists, including psychiatrists, radiologists, and pathologists, show the highest charges per RVU, followed by medical specialists, with GPs exhibiting the lowest average charges per RVU ($5.96 - $6.54). Board certified physicians also show considerably higher charges per RVU, 10 percent higher on average, again consistent with the lower GP charges.

One interesting finding is the negative relationship between charges and physician age. We might have expected charges, like workloads, to rise at first as the physician gains on-the-job training and a referral network, but eventually falling as skills obsolesce with advancing age. An even finer breakdown (see Table 5-5) of the relationship into age deciles, however, still shows the same phenomenon: physicians in the younger deciles uniformly show the highest charges. Holding other variables like specialty and board certification constant does not appear to affect this relationship, as we shall see later.

Of course, with extensive usual, customary, and reasonable reimbursement methods, stated charges may be inflated and not truly reflect actual payments. For example, data at the bottom of Table 5-4

TABLE 5-5. WEIGHTED CHARGES AND PAYMENTS

BY YEAR BY PHYSICIAN AGE DECILE

AGE GROUP	1973		1975		1978	
	WAFEE	WAPAY	WAFEE	WAPAY	WAFEE	WAPAY
27 - 38	$6.36	$5.41	$7.33	$6.14	$9.18	$7.67
39 - 42	6.14	5.31	7.23	6.00	9.09	7.52
43 - 46	5.94	5.11	7.06	5.82	8.97	7.45
47 - 49	5.91	5.14	6.92	5.77	8.68	7.29
50 - 52	5.91	5.18	6.97	5.81	8.71	7.34
53 - 56	5.81	5.08	6.83	5.69	8.56	7.16
57 - 59	5.67	5.02	6.60	5.59	8.27	7.03
60 - 63	5.78	5.12	6.69	5.68	8.34	7.07
64 - 68	5.71	5.15	6.60	5.63	8.02	6.86
69+	5.59	5.08	6.33	5.56	7.68	6.61

NOTES:
CHG = WAFEE (Average Total Charge per RVU, COL deflated
PAY = WAPAY (Average Blue Shield or Medicare Payment per RVU, COL deflated

show payments to be about one dollar less than charges per RVU, or about 16 percent overall (e.g., for medium MDPOP areas ($5.68 compared to $6.60). Younger physicians still enjoy higher payments, however, in practically every age decile comparison. Moreover, the ratio of average payments to charges is constant within age decile (about 83 percent) until about age 65 when the ratio rises to 88 percent.

It would appear that under Blue Shield and Medicare reimbursement principles, more is being charged by younger physicians, and these higher rates are being passed through in terms of payments. As these charges are already adjusted for both relative value content and cost-of-living, it is hard to explain remaining premiums. A varying specialty mix by physician age cohort is a logical explanation, but can this account for all of the difference in the youngest three deciles? Multivariate work will consider this issue in a more comprehensive fashion later in this report.

Returning to Table 5-4, we further note that both charges and payments per RVU rise with physician density. Low MDPOP areas exhibit average charges of $6.48 compared to $7.36 in high MDPOP areas, a difference of 14 percent. Payments also are higher in more competitive areas, although the discrepancy is only 9 percent. When examined by specialty, the relationship is less clear among the three MDPOP areas. Nevertheless, fees per RVU are about 10 percent higher in high vs. low MDPOP areas, with the largest difference being among surgical specialists where fees are 16 percent higher. Nearly identical fee and payment relationships exist holding board certification or age constant. If sheer numbers of direct patient care physicians lead to enhanced competition and lower fees, these simple cross-sectional results do not show it, neither

for the sample as a whole nor for more homogeneous subgroups.

Falling workloads with increased physician supplies are expected as pro rata demand per physician shifts in. Physicians may induce more care, on the other hand, by treating each patient seen more intensively. Regarding this possibility, the results in Table 5-4 are mixed. For GPs and medical specialists the utilization rate per patient seen falls as we move from low to medium MDPOP areas, then rises again from medium to high areas. The rate is consistently negative for surgical specialists, on the other hand. Without a more definitive measure of case mix, it is difficult to explain these results. If patient severity of illness is related to physician density, either within area or due to patient migration, the case mix and competitive effects will be confounded. Why the relationship is not consistent across specialty still is unexplained, however.

D. TRENDS IN PHYSICIAN CHARGES AND PATIENT UTILIZATION RATES

Cross-sectional results provide only a still-life of dynamic market behavior. Tables 5-6 and 5-7 present trends in charges and utilization rates per patient seen by broad specialty group by physician density (low, medium, and high). The first column gives the number of physicians while the last provides the percent change over the six year period.

The single largest group of general and family practitioners, 2,717 physicians in all, showed average fee increases per RVU of 42 percent over the six years, or slightly over 8 percent per annum. Except for the "other" specialties group, this was the lowest rate of fee inflation in

TABLE 5-6. WEIGHTED CHARGES BY SPECIALTY BY PHYSICIAN DENSITY, 1973 - 1978

SPECIALTY/MD DENSITY	(MDS)	1973	1974	1975	1976	1977	1978	% Δ 1973-78
ALL PHYSICIANS		$5.89	$6.19	$6.87	$7.42	$7.95	$8.56	
GP/FP	2717	5.37	5.60	6.18	6.63	7.12	7.64	42%
LOW	1030	5.18	5.39	5.96	6.41	6.89	7.36	42
MEDIUM	742	5.23	5.47	6.02	6.45	6.90	7.44	42
HIGH	945	5.70	5.93	6.54	7.02	7.54	8.10	42
MEDICAL SPECIALISTS	930	6.24	6.56	7.32	7.87	8.43	9.08	46
LOW	194	5.87	6.14	6.90	7.36	7.92	8.52	45
MEDIUM	261	5.89	6.19	6.81	7.35	7.83	8.57	46
HIGH	475	6.59	6.94	7.77	8.36	8.97	9.60	46
SURGICAL SPECIALISTS (EXCL. GS)	1164	6.29	6.64	7.37	8.04	8.55	9.22	47
LOW	336	6.08	6.42	7.08	7.74	8.16	8.83	45
MEDIUM	375	5.97	6.30	7.02	7.61	8.17	8.86	48
HIGH	453	6.72	7.08	7.88	8.61	9.15	9.82	46
OTHER SPECIALISTS	224	6.57	6.87	7.37	7.87	8.42	9.06	38
LOW	63	6.20	6.65	7.10	7.68	8.06	8.51	37
MEDIUM	60	6.24	6.45	7.10	7.33	7.70	8.78	41
HIGH	101	6.99	7.26	7.69	8.32	9.07	9.56	37
INTERNAL MEDICINE	1064	6.08	6.42	7.10	7.60	8.13	8.75	44
LOW	255	5.96	6.23	6.93	7.58	8.07	8.74	47
MEDIUM	328	5.85	6.16	6.76	7.22	7.75	8.30	42
HIGH	481	6.29	6.70	7.42	7.87	8.43	9.07	44
GENERAL SURGEONS	707	5.86	6.19	6.99	7.62	8.16	8.85	51
LOW	268	5.63	5.91	6.59	7.14	7.81	8.51	51
MEDIUM	208	5.57	5.87	6.70	7.24	7.70	8.34	50
HIGH	231	6.39	6.81	7.72	8.50	8.98	9.71	52
OB/GYN	486	6.40	6.91	7.70	8.57	9.23	10.04	57
LOW	121	5.75	6.22	6.98	7.58	8.25	9.02	57
MEDIUM	154	6.11	6.71	7.38	8.28	8.91	9.71	59
HIGH	211	6.98	7.45	8.34	9.34	10.04	10.86	56

TABLE 5-7. WEIGHTED UTILIZATION RATES BY SPECIALTY BY PHYSICIAN DENSITY, 1973 - 1978

SPECIALTY/MD DENSITY (N)	1973	1974	1975	1976	1977	1978	%Δ 1973-78
GPs/FPs	6.24	6.24	6.06	6.06	5.76	5.59	-10.4%
LOW	6.63	6.61	6.36	6.46	6.24	6.01	- 9.4
MEDIUM	5.80	5.83	5.79	5.82	5.61	5.51	- 5.0
HIGH	6.15	6.17	5.95	5.80	5.36	5.20	-15.4
MEDICAL SPECIALISTS	4.98	5.03	4.95	4.71	4.44	4.42	-11.2
LOW	5.10	5.01	4.94	4.48	4.37	4.31	-15.5
MEDIUM	4.48	4.31	4.20	4.02	3.73	3.69	-17.6
HIGH	5.20	5.44	5.36	5.18	4.85	4.87	- 6.3
SURGICAL SPECIALISTS (EXCL. GS)	4.19	4.03	3.87	3.63	3.36	3.16	-24.6
LOW	5.15	4.89	4.60	4.26	4.02	3.79	-26.4
MEDIUM	4.00	3.88	3.71	3.46	3.14	2.86	-28.5
HIGH	3.64	3.52	3.46	3.30	3.04	2.93	-19.5
OTHER SPECIALISTS	3.00	2.98	3.04	2.99	2.91	2.89	- 3.7
LOW	2.78	2.69	2.88	2.82	2.85	2.94	- 5.8
MEDIUM	3.43	3.49	3.26	3.15	2.84	2.69	-21.6
HIGH	2.88	2.85	3.01	3.00	2.98	2.97	3.1
INTERNAL MEDICINE	7.93	7.92	7.80	7.73	7.43	7.30	- 7.9
LOW	8.91	8.70	8.34	8.17	7.92	7.81	-12.3
MEDIUM	7.67	7.61	7.76	7.66	7.38	7.24	- 5.6
HIGH	7.58	7.72	7.54	7.54	7.20	7.07	- 6.7
GENERAL SURGEONS (GS)	2.84	2.94	3.05	2.97	2.88	2.84	0.0
LOW	3.22	3.24	3.35	3.29	3.15	2.93	- 9.0
MEDIUM	2.74	2.84	2.86	2.73	2.73	2.81	2.6
HIGH	2.51	2.69	2.87	2.81	2.71	2.76	10.0
OB/GYN	8.63	8.67	8.56	7.94	6.93	6.69	-22.5
LOW	9.13	9.38	9.24	8.76	7.99	7.70	-15.7
MEDIUM	9.33	9.34	9.43	8.39	7.58	6.97	-25.3
HIGH	7.82	7.77	7.53	7.14	5.85	5.89	-24.7

the sample. OB-GYNs exhibited the highest rate of increase, 57 percent, followed by general surgeons at 51 percent.

As is evident from the last column in Table 5-6, there is practically no difference in the rate of fee inflation by extent of physician competition, even within specialty. If fees were higher in physician-dense areas in the past due to differences in market characteristics, one might have expected market competition to narrow the fee gap over time as physicians face falling workloads and migrate across areas. Nevertheless, no evidence is found of narrowing fees in Table 5-6. General surgeons, for example, who are agreed already to be in oversupply (ACS, 1975), charged $1.20 per RVU more in high vs. low MDPOP areas in 1978 compared to a $.76 difference in 1973. The same pattern holds true within every other broad specialty group, as if fees moved completely independent of physician availability.

Overall utilization rates per patient seen in Table 5-7 would appear to be falling consistently over time -- except for general surgeons where the rate is unchanged. Several factors might explain declining rates. First, many of the 23 procedures that make up the total utilization, or workloads, of our physician panel involve nonrepetitive surgery, e.g., tonsillectomy, cholecystectomy, resection of prostate, hysterectomy, excision of lens. For an unchanged clientele, organ removal in any period naturally reduces the probability of a similar procedure in subsequent periods. The impact of nonrepetitive surgery on our intensity measure will become more evident when we look at individual procedures. Second, our utilization rates would not automatically reflect population-based utilization rates (U/POP) which can be represented as:

$$U/POP \equiv (U/PAT) \cdot (PAT/MD) \cdot (MD/POP)$$

where U/PAT = utilization per patient seen, PAT/MD = number of distinct patients per physician, and MD/POP = physician population ratio. Utilization rates per capita can be rising over time, even though utilization per patient seen is falling, if physicians are: (a) seeing more patients per period; (b) the supply of physicians per capita is rising; or (c) both.

Another reason for declining utilization is the use of relative values in weighting procedures rather than a simple sum of services. Many of the nonrepetitive surgical procedures in our sample are weighted 40-60 times more than regular office visits. Thus, any downward bias due to this factor is accentuated.

Fourth, several of the selected procedures in our data base have actually been exhibiting declining rates nationally, including tonsillectomies, and obstetrical deliveries (NCHS, 1973, 1977).

Fifth, our study has focused on many well-defined, more routine procedures for which a consistent time-series is available. To the extent physicians have been "upgrading" procedures or expanding into new areas of diagnosis and treatment, our intensity measure would be biased downwards. Vaginal deliveries are a good example of this phenomenon. Over the last decade a pronounced shift in favor of caesarian sections has taken place (ACS, 1975), a shift not reflected in our narrow definition of obstetrical deliveries.

And finally, changes in production and billing patterns for lab and radiological services can also reduce utilization rates using claims data from a panel of physicians. If physicians are requesting ancillary tests at an increasing rate using outside clinical labs, these are billed separately and are not included in our trends of ancillary utilization per patient seen by a particular physician. While most of the ancillary testing per patient is still growing over time in spite of the use of physician panel claims data, the rates are lower than expected (see Table 5-8 below).

Notwithstanding these problems, the utilization rates in Table 5-7 should have some meaning across physician market areas. If rates per patient seen are falling in our sample, we might expect them to fall less rapidly in competitive areas as physicians provide more services to a more limited patient clientele. With the notable exception of general practitioners and OB-GYNs, this is the case. RVU-weighted utilization per patient seen by medical specialists, for example, fell 15-17 percent over the six years in low and medium MDPOP areas compared to a reduction of only 6.3 percent in high MDPOP areas. For general surgeons the difference was in direction as well as degree: the rate in low MDPOP areas was -9.0 percent compared to a 10 percent increase in high areas. Changes in exogenous factors (e.g., population growth, changing demographics) may explain most of these differences, and more definitive conclusions must await the multivariate work.

Table 5-8 provides an even more disaggregated picture of trends in fees and utilization rates by individual procedure by degree of physician competition. For brevity only the two end years of the series are shown,

TABLE 5-8. **PHYSICIAN CHARGES, DEFLATED, AND PATIENT UTILIZATION RATES BY PHYSICIAN AREA BY YEAR BY PROCEDURE**

PROCEDURE AND YEAR	PHYSICIAN CONCENTRATION RATIOS						TOTAL	
	LOW		MEDIUM		HIGH			
	AFEE	URT	AFEE	URT	AFEE	URT	AFEE	URT
Colles Fracture								
1973	$106.63	.034	$101.24	.030	$108.78	.039	$105.48	.034
1978	164.71	.028	161.28	.024	165.02	.024	163.61	.025
% Δ	10.9%	-3.5%	11.9%	-4.0%	10.0%	-7.7%	11.0%	-5.3%
Tonsillectomy								
1973	$ 98.77	.111	$ 91.62	.108	$ 94.55	.134	$ 93.82	.119
1978	164.04	.047	147.72	.037	162.67	.036	156.02	.038
% Δ	13.2%	-11.5%	12.3%	-13.1%	14.4%	-14.6%	13.3%	-13.6%
Proctosigmoidoscopy								
1973	$ 19.55	.104	$ 17.28	.155	$ 19.22	.165	$ 18.72	.142
1978	29.64	.117	26.60	.180	26.81	.166	27.63	.155
% Δ	10.3%	2.5%	10.8%	3.2%	7.9%	.1%	9.5%	1.8%
Cholecystectomy								
1973	$314.39	.030	$318.13	.033	$320.83	.039	$317.47	.033
1978	464.51	.024	462.70	.025	496.18	.024	470.01	.024
% Δ	9.5%	-4%	9.1%	-4.8%	10.9%	-7.7%	9.6%	-5.5%
Herniorrhaphy								
1973	$198.60	.039	$193.75	.037	$204.73	.046	$198.49	.040
1978	302.36	.034	294.97	.037	329.95	.051	307.54	.040
% Δ	10.5%	-2.6%	10.5%	0%	12.2%	2.2%	11.0%	0%

TABLE 5-8. (CONTINUED)

PROCEDURE AND YEAR	PHYSICIAN CONCENTRATION RATIOS						TOTAL	
	LOW		MEDIUM		HIGH			
	AFEE	URT	AFEE	URT	AFEE	URT	AFEE	URT
Resection prostate								
1973	$410.07	.083	$396.76	.092	$417.94	.093	$408.42	.091
1978	579.42	.081	563.57	.076	640.81	.092	599.25	.084
% Δ	8.3%	-.5%	8.4%	-3.5%	10.7%	-.2%	9.3%	-1.5%
D & C								
1973	$ 88.08	.081	$ 87.35	.091	$ 98.32	.083	$ 90.97	.086
1978	137.76	.064	140.47	.078	171.29	.081	149.26	.075
% Δ	11.3%	-4.2%	12.2%	-2.9%	14.8%	-.5%	12.8%	-2.6%
Hysterectomy								
1973	$344.53	.055	$351.51	.059	$370.80	.061	$354.11	.058
1978	506.13	.033	534.29	.036	558.80	.034	531.32	.035
% Δ	9.4%	-8.0%	10.4%	-7.8%	10.1%	-8.9%	10.0%	-7.9%
Laminotomy								
1973	$474.83	.090	$462.87	.046	$502.80	.028	$470.19	.051
1978	680.75	.065	727.30	.041	709.68	.012	717.19	.041
% Δ	8.7%	-5.6%	11.4%	-2.2%	8.2%	-11.4%	10.5%	-3.9%
Excision of lens								
1973	$391.28	.173	$387.52	.163	$401.87	.094	$393.45	.144
1978	571.96	.096	546.23	.080	577.84	.049	565.05	.075
% Δ	9.2%	-8.9%	8.2%	-10.2%	8.8%	-9.6%	8.7%	-9.6%
Obstetrical delivery								
1973	$202.24	.226	$227.40	.264	$262.25	.298	$230.72	.263
1978	324.85	.203	379.00	.198	434.68	.244	379.65	.215
% Δ	12.1%	-2.0%	13.3%	-5.0%	13.2%	-3.6%	12.9%	-3.7%

TABLE 5-8. (CONTINUED)

PROCEDURE AND YEAR	PHYSICIAN CONCENTRATION RATIOS						TOTAL	
	LOW		MEDIUM		HIGH			
	AFEE	URT	AFEE	URT	AFEE	URT	AFEE	URT
X-ray, Chest								
1973	$ 16.90	.250	$ 17.31	.327	$ 18.68	.340	$ 17.76	.312
1978	21.74	.283	21.89	.347	23.12	.356	22.35	.333
% Δ	5.7%	2.6%	5.3%	1.2%	4.8%	.9%	5.2%	1.3%
Upper GI								
1973	$ 34.86	.128	$ 33.16	.126	$ 38.83	.140	$ 36.38	.133
1978	45.24	.090	45.13	.080	51.38	.117	48.11	.101
% Δ	6.0%	-5.9%	7.2%	-7.3%	6.5%	-3.3%	6.5%	-4.8%
Brief Office Visit								
1973	$ 5.68	1.852	$ 6.14	1.563	$ 6.41	2.202	$ 6.09	1.886
1978	8.73	1.695	9.14	1.367	9.57	1.552	9.16	1.541
% Δ	10.7%	-1.7%	9.8%	-2.5%	9.9%	-5.9%	10.1%	-3.7%
Intermediate Office Visit								
1973	$ 7.66	1.052	$ 8.10	.918	$ 8.96	1.381	$ 8.31	1.150
1978	10.60	1.381	11.36	1.149	12.73	1.703	11.68	1.450
% Δ	7.7%	6.3%	8.0%	5.0%	8.4%	4.7%	8.1%	5.2%
Initial Hospital Visit								
1973	$ 26.85	.321	$ 26.34	.269	$ 28.34	.230	$ 27.18	.272
1978	35.81	.284	36.14	.243	40.14	.200	37.40	.241
% Δ	6.7%	-2.3%	7.4%	-1.9%	8.3%	-2.6%	7.5%	-2.3%
Brief Hospital Visit								
1973	$ 5.58	2.313	$ 5.57	2.009	$ 6.64	1.407	$ 5.87	1.934
1978	8.86	1.412	8.56	1.327	10.18	.891	9.11	1.231
% Δ	11.8%	-7.8%	10.7%	-6.8%	10.7%	-7.3%	11.0%	-7.3%

TABLE 5-8. (CONTINUED)

PROCEDURE AND YEAR	PHYSICIAN CONCENTRATION RATIOS						TOTAL	
	LOW		MEDIUM		HIGH			
	AFEE	URT	AFEE	URT	AFEE	URT	AFEE	URT
Intermediate Hosp Visit								
1973	$ 8.40	1.781	$ 8.20	1.696	$ 9.47	1.705	$ 8.76	1.726
1978	12.02	1.621	12.07	1.561	14.29	1.643	12.92	1.612
% Δ	9.1%	-1.8%	9.4%	-1.6%	10.2%	-0.7%	9.5%	-1.3%
EKG								
1973	$15.54	.297	$14.75	.403	$16.18	.556	$15.65	.451
1978	19.74	.308	19.17	.411	20.15	.505	19.79	.431
% Δ	5.4%	.7%	6.0%	.4%	4.9%	-1.8%	5.3%	-.9%
Urinalysis								
1973	$ 2.35	.263	$ 2.48	.280	$ 2.56	.422	$ 2.49	.353
1978	2.99	.306	3.08	.396	3.47	.462	3.27	.409
% Δ	5.5%	3.3%	4.8%	8.3%	7.1%	1.9%	6.3%	3.2%
Fasting blood sugar								
1973	$ 3.50	.351	$ 3.67	.273	$ 3.78	.507	$ 3.68	.419
1978	4.16	.405	4.20	.340	4.51	.513	4.35	.450
% Δ	3.8%	3.1%	2.9%	4.9%	3.9%	.2%	3.6%	1.5%
Complete blood count								
1973	$ 4.64	.198	$ 4.74	.319	$ 4.94	.318	$ 4.85	.294
1978	5.44	.260	5.66	.444	6.12	.363	5.90	.355
% Δ	3.5%	6.3%	3.9%	7.8%	4.8%	4.3%	4.3%	4.1%
Comprehensive consult.								
1973	$28.49	.159	$27.57	.159	$31.10	.211	$29.29	.180
1978	40.21	.153	39.85	.157	46.78	.203	42.81	.175
% Δ	8.2%	-.8%	8.9%	-.3%	10.1%	-.8%	9.2%	-.6%

along with the annualized percent change. Taking the surgical procedures first, one might expect a higher rate of fee inflation for more elective procedures, generally, if physicians induce surgery; and less inflation for those procedures that are more or less out of the physician's control. Within procedure, inflation should vary inversely with physician density without inducement. Colles fractures and deliveries, as nondiscretionary procedures, provide a limited control for the more elective procedures. Utilization rates, ceteris paribus, should also grow more slowly (or decline more rapidly) for these two services. Confounding this interpretation, however, is the nonrepetitive procedure problem discussed above.

Ranking surgical procedures by the rate of fee inflation, tonsillectomy fees showed the highest rate of increase (13.3 percent), followed by normal deliveries (12.9 percent), and D&Cs (12.8 percent). Charges for Colles fractures were about in the middle (11.0 percent) while lens excisions at 8.7 percent and resections of the prostate (9.3 percent) showed the slowest rates of fee inflation.

The noticeable decline in tonsillectomies per patient seen (13.6 percent per year), like lens excisions, might have discouraged rapid fee inflation for physicians performing these procedures. Yet, inflation rates for these two procedures were at opposite ends of the inflation continuum: tonsillectomies were the highest, while lens excisions were the lowest. A closer examination of the utilization rates for lens excision suggests that the declining rate over time is more apparent than real. For example, assume that ophthalmologists perform a certain number

of excisions each year (U_t) on their remaining patients who have not undergone such surgery (R_t):

$$(V.1) \qquad U_t = r_t \cdot R_t$$

where

$$(V.2) \qquad R_t = (R_{t-1} - U_{t-1}) + (P_{t-1} - P_{t-1})$$

and r_t = surgery rate in year t adjusted for nonrepetitive surgery, $P_t - P_{t-1}$ = change in the number of patients. The first term in parentheses in equation (V.2) constitutes the remaining patients after last year that had not had surgery, while the second parenthetical term reflects the growth in new patients potentially eligible for the operation. By reduction, the first term in parentheses can be replaced by the term, $P_{t-1} - \sum_{j}^{t-1} U_j$, and (V.2) can be simplified such that:

$$(V.3) \qquad U_t = r_t^* \left(P_t - \sum_{j}^{t-1} U_j\right)$$

or

$$(V.4) \qquad r_t^* = U / \left(P_t - \sum_{j}^{t-1} U_j\right)$$

which is considerably different from the unadjusted rate, $r_t = (U/P)_t$.

Without knowing the complete operating history of the physician, we do not have an accurate measure of his cumulative surgeries up to any period. We do know, however, that surgeons in our sample performed 11,777 lens excisions in 1973, almost entirely on 89,000 Medicare enrollees, an

unadjusted rate of 13.2 percent. By 1978, the number had fallen to 10,217 even though Medicare patients seen by these surgeons had grown to 152,000, giving an unadjusted rate of 6.7 percent. Adjusting for cumulative surgery from 1973-77, which totalled 48,070 operations for our sample, increases the actual surgery rate on true candidates to 11 percent in 1978, or only two percentage points less than in 1973. While this adjustment is admittedly crude, it does illustrate the extent of the downward bias in some of the utilization rate trends in Table 5-8 and others given earlier. By way of contrast, proctosigmoidoscopies, which are repetitive diagnostic procedures, apparently do not suffer from previous activity as the positive utilization rates show.

Considering surgical trends across areas of differing physician concentration, we note first that fees are invariably higher as the number of direct patient care physicians increases, even though fees have been deflated by a geographic cost of living index. Furthermore, as in earlier tables, no evidence is found for a narrowing of fee differentials within procedure over time. For seven of the eleven procedures, fees in high MDPOP areas rose faster than in low concentration areas, led by D&Cs and tonsillectomies at 14.8 and 14.4 percent, respectively. Even normal delivery fees rose as fast or faster in high as compared to low and medium MDPOP areas.

Leaving the surgical procedures and turning next to a set of five visits, two office (brief and intermediate) and three hospital (initial comprehensive with exam, brief, and intermediate), we find generally lower fee inflation than for surgery, but no systematic difference between MDPOP areas. There does appear to have been a definite shift away from less to

more complicated types of visits, however. Whereas brief office visits fell as a proportion of patients seen from 1.9 in 1973 to 1.5 in 1978, intermediate visits rose .3 percentage points, leaving the total number of office visits of these two types per patient seen unchanged (approximately 3.0). In 1973 the average yearly bill for three office visits was approximately $21 (= $6.09 (1.89) + $8.31 (1.15)) per patient seen. By 1978, the figure had risen to $31, a 50 percent increase in just five years. If visit proportions had not changed, the cost in 1978 would have been $30.74, a trivial difference, with part of the higher weight given to a more expensive visit being offset by a slower rate of inflation. Still, the relative similarity in charges to begin with would require very wide swings in procedure frequencies to materially affect the overall inflation rate for office visits, at least over a few years.

Brief and intermediate hospital visits show a similar shift, although overall rates have declined for both -- again due to the declining surgery rates per patient seen. As before, fee inflation appears to be independent of physician concentration.

The last set of services includes six diagnostic tests: chest x-ray, upper GI, EKG, urinalysis, fasting blood sugar, and a complete blood count. Most of these procedures show positive growth rates per patient seen, as expected. Complete blood counts per patients seen, for example, grew at a rate of 4.1 percent per year, followed by urinalysis at 3.2 percent. In 1973, these six tests averaged $21.28 per patient seen, rising to $26.22 by 1978, roughly a 25 percent increase. While a significant increase, this is still far below the increases recorded for

surgical procedures and office visits, both of which involve considerable physician input.

If physicians induce demand under increased competition to meet target incomes, Reinhardt (1978) hypothesizes that it should show up in these ancillary services which require little physician input (and hence, personal cost). As Table 5-8 shows, ancillary intensity is positively correlated with physician concentration. Twenty-eight percent of patients seen in 1978 by low MDPOP physicians had a chest x-ray compared to nearly 36 percent in high MDPOP areas. Rates for the other ancillaries in low and high areas were: upper GI, 9 vs. 12 percent; EKG, 31 vs. 51 percent; urinalysis, 31 vs. 46 percent; blood sugar 41 vs. 51 percent; and a complete blood count, 26 vs. 36 percent. Fees per ancillary procedure are also systematically higher in physician-dense areas, even after COL deflation.

As fees and intensity may be partially explained by the specialist performing the procedure, care must be taken in making comparisons across MDPOP areas. Table 5-9 goes one step further and disaggregates three ancillary procedures (chest x-rays, EKGs, and urinalyses) by the major specialty groups billing Blue Shield and Medicare for the procedure. In our sample 86 radiologists performed the required number of chest x-rays compared to 130 in the "other" specialties group (including therapeutic radiologists). About equal numbers of GPs and internists performed EKGs, while more GPs billed for urinalyses. Of course, GPs are almost three times more plentiful in our physician panel than internists (2,717 vs. 1,064). Thus, only 27 percent of GPs report doing EKGs compared to 73 percent of internists. For urinalyses, the percentages are 20 and 37

TABLE 5-9. PHYSICIAN CHARGES, DEFLATED, AND PATIENT UTILIZATION RATES BY PHYSICIAN AREA BY YEAR BY SPECIALIST, SELECTED ANCILLARY PROCEDURES

PROCEDURE/ SPECIALTY	LOW		MEDIUM		HIGH		AVERAGE	
	FEES	UR	FEES	UR	FEES	UR	FEES	UR
CHEST X-RAY								
- Radiologists		(31)		(11)		(44)		(86)
1973	$16.68	.21	$16.95	.33	$19.04	.32	$17.93	.28
1978	21.93	.30	22.53	.35	23.65	.37	22.89	.34
- Other		(26)		(56)		(48)		(130)
1973	$17.71	.33	$17.17	.39	$18.17	.40	$17.65	.38
1978	22.21	.34	21.63	.39	22.53	.35	22.08	.37
EKG								
- GPs/FPs		(199)		(167)		(378)		(744)
1973	$15.28	.20	$14.61	.29	$16.29	.44	$15.64	.34
1978	19.62	.21	18.45	.28	19.81	.39	19.45	.32
- Medical		(49)		(62)		(135)		(246)
1973	$15.77	.31	$14.92	.46	$16.55	.73	$15.98	.58
1978	19.92	.35	19.87	.46	21.34	.71	20.69	.58
- Internists		(203)		(216)		(355)		(774)
1973	$15.52	.39	$14.52	.51	$15.59	.63	$15.27	.53
1978	19.50	.40	19.15	.52	19.79	.56	19.53	.51
URINALYSIS								
- GPs/FPs		(158)		(76)		(318)		(552)
1973	$ 2.12	.23	$ 2.12	.30	$ 2.45	.41	$ 2.31	.34
1978	2.78	.33	2.60	.37	3.45	.39	3.14	.37
- Internists		(94)		(93)		(206)		(393)
1973	$ 2.45	.31	$ 2.52	.32	$ 2.50	.46	$ 2.49	.39
1978	3.17	.29	3.29	.42	3.33	.51	3.29	.44

NOTE: Numbers of physicians are given in parentheses.

percent for GPs and internists, respectively. These percentages did not vary much across internists by MDPOP area, but they more than doubled for GPs between low and high areas of physician concentration. Finally, the specialist mix is relatively similar in low and high MDPOP areas but vastly different in medium MDPOP areas where "other" specialists outnumbered radiologists five to one. For urinalysis, it is just the opposite: GPs dominate in low and high areas while similar in number to internists in medium areas.

For both chest x-rays and EKGs, average charges appear unrelated to physician concentration even within specialty, with the possible exception of GPs performing x-rays. Nor is there any systematic difference in fees across specialties performing the identical procedure. Internists, for example, charge about the same for an EKG as a GP. EKG utilization rates do vary systematically by MDPOP area, however, holding provider specialty constant. GPs practicing in low MDPOP areas, for instance, ran EKGs on one out of five patients in 1978, while their counterparts practicing in high MDPOP areas ran an EKG on almost two out of five, a two-fold difference. The difference is somewhat lower for internists, but still dramatic (50 percent).

Urinalysis patterns differ from the other two ancillaries only in that <u>both</u> fees and utilization rates appear to be positively related to physician concentration. Internists charged \$0.92 (= \$3.17 x .29) on average for urinalyses per patient seen in low MDPOP areas compared to \$1.70 (= \$3.33 x .51) in high MDPOP areas; most of the difference due to intensity. Except in high MDPOP areas, internists also charged significantly more than GPs for presumably the identical urinalysis.

Utilization trends show no consistent patterns within specialty by type of ancillary. Sometimes intensity is growing in high MDPOP areas relative to less competitive areas (e.g., urinalyses for internists), sometimes it is falling (e.g., urinalyses for GPs, EKGs for internists). Fees, however, are uniformly greater over time, independent of the number of physicians per capita.

In sum, higher ancillary utilization rates in high MDPOP areas cannot be explained away by a varying specialty mix, nor can the failure of average ancillary fees to fall with more competition. It is also unclear why internists charge more on average for urinalyses when they do not for EKGs.

VI. ECONOMETRIC FINDINGS

A. EQUATION SPECIFICATION

Many factors besides competition affect fees and services of individual physicians, and tabular analyses have distinct limitations in adjusting for confounding variables. In this section a simple behavioral model is specified that allows for a test of physician inducement holding many of the relevant variables constant.

Assume the following three equation models of physician behavior:

$$(VI.1) \quad P_d = d(Q_d;N;I;MDQ;METRODRS): \text{ Demand}$$

$$(VI.2) \quad P_s = s(Q_s;Z): \text{ Supply}$$

$$(VI.3) \quad Q_d = Q_s \quad S'(p_s;Z) \text{ from (V.2): Equilibrium}$$

where P_d and P_s respectively are the demand and supply prices; Q_d and Q_s are the quantities demanded and supplied; N = vector of patient medical need characteristics; I = vector of ability/willingness to pay characteristics; MDQ = vector of physician characteristics proxying the perceived quality of care; METRODRS = number of direct patient care physicians per capita; and Z = vector of supply-influencing variables. Substituting (VI.1) and (VI.2) into (VI.3) and setting demand and supply prices equal, we derive the reduced-form price ($\overline{P}$) equation:

$$(VI.4) \qquad \overline{P} = g(N;I;MDQ;Z;METRODRS)$$

which provides a major test of competitive effects on inducement. More physicians per capita in a market area should shift pro rata demands per physician in, lowering equilibrium fees. If it does not, then demand inducement may have occurred.

A second test of inducement involves a similar solution of the model for Q, or physician workloads, which can be decomposed into the service intensity per patient (S/P) times the number of distinct patients seen (P) per period:

$$(VI.5) \qquad \overline{Q} \equiv (S/P) \cdot \overline{P} = h(N;I;MDQ;Z;METRODRS)$$

Ceteris paribus, more physicians in an area should lower workloads, although total utilization would likely increase due to price competition. That is, workloads fall, but not as much percentage-wise as the increase in the number of practicing physicians, because (hypothesized) lower prices avoid a strictly proportionate decline. If more physicians are "dividing up" a relatively fixed number of patients, then inducement may be present in the intensity of care provided per patient. Without holding price explicitly constant using simultaneous equation techniques, no output-related test can be considered definitive evidence of inducement, but still it would be important for policymakers to know that increased competition does lead to more intensive care per patient seen. Thus, (VI.5) will also be estimated with intensity as a dependent variable.

B. DEPENDENT AND INDEPENDENT VARIABLES

Three basic dependent variables were specified -- one reflecting charges per RVU; one measuring intensity per patient seen; and a third reflecting total services, or workloads, of the physician. Construction of the variables has already been described in the data base section above. Charges, along with other dollar variables, have been deflated by the county-estimated CPI. For the summary file, all dependent variables are derived as weighted sums of the 23 individual services. Thus, charges are per RVU, utilization rates are RVUs per patient seen, and total services are simply total RVUs per physician across 23 procedures for Blue Shield-plus-Medicare lines of business. For individual procedure regressions, no weights are required.

Independent variables are categories by medical need, ability or willingness to pay, physician quality, and supply-influencing. Under medical need we have the percent of population living in urban areas (POPURB), percent minority (POPMINOR), percent female (POPFEM), percent less than five years old (POPLT5), percent greater than 65 (POPGT65), and the population per square mile (POPDENSE). Age, sex, minority status, and urbanization have all been found in past research to affect health status and the need for physician services.

For ability/willingness to pay, we have median school years completed (SCHYRS), unemployment rates (WORKUNEM), percent of workforce that are laborers (WORKLAB), percent of population under poverty level (POPPOV), deflated per capita income (ADJPCINC), and deflated medical assistance and Medicare Part B payments per capita (MEDAS, MEDB). Schooling, the poor,

and laborers may also reflect health status as well, with possible offsetting effects (e.g., laborers are more likely to incur job-related illnesses yet have less health insurance). The ability to pay for medical care should be higher where incomes are higher and fewer people are in poverty, where fewer workers are unemployed, and where Medicaid and Medicare payments per capita are higher.

Demand should also be greater where perceived physician quality is higher. Proxies for quality include whether the practitioner is an M.D. or a D.O. (DEGREE = 1 for M.D.s), whether he is board certified (BOARD), his broad specialty group (SP1 = GP/FP; SP2 = medical specialist; SP3 = surgical specialist), and years since licensure. Board certified M.D.s specializing in medicine or surgery should command higher fees. Years since licensure, or work experience, would be predicted to have an inverted U-shaped relationship to perceived quality, and to fees, as physicians gain skills and referrals over time, then begin to lose patients as skills and referrals decline.

Supply-influencing variables include several of the physician characteristics described above plus hospital beds per 1,000 population (HOSPBDS), deflated local area wage rates (ADJDRWAG) and the physician's willingness to participate in Blue Shield and take Medicare patients on assignment (P1 = Blue Shield participating with Medicare assigned claims exceeding five percent; P2 = Blue Shield nonparticipating with assignment less than five percent; P3 = Blue Shield participating with assignment less than five percent). Hospital beds in an area provide a complementary input to physicians' practices, raising productivity, and increasing supply -- particularly of surgery. Higher wages for physician inputs

should discourage supply and raise wages. According to dual market theory (Sloan, Cromwell, and Mitchell, 1978), physicians who participate in public programs like Medicare do so after private fees, or more accurately, marginal revenues, fall below UCR rates. Inclusion of dummy variables to separate participants from nonparticipants adjusts for market segmentation on the demand side. It may also account for relevant demand/supply variables that have been left out of our independent variable list. Because the physician's participation decision is predetermined, in part, by the strength of demand, and thus is endogenous to fees, participation dummies were excluded from some runs. The regression coefficients were not significantly affected, however, so the dummies are included in the equations shown below.

Finally, in order to capture intertemporal trends in general inflation in input prices, changing technology, and other demand/supply variables for which we had little time series information, yearly time dummies (Y1 - Y5) have been included: Y1 = 1974, ..., Y5 = 1978, with 1973 implicitly included in the constant term.

In addition, two measures of physician supplies, or competition, were used. METRODRS equals the number of direct patient care physicians in the physician's market area (one of 13 areas) per 100,000 population (later scaled per 1,000 in the tables) while GPPER equals the number of GPs and FPs per 100,000. As previously discussed, more physicians per capita should reduce physician demand on a pro rata basis and should lower fees if market fee competition is present. The availability of general practitioners, however, may act as a substitute (or complement) to certain specialist procedures, and have a negative or positive effect on fees and

demand. Separating out nonspecialist supplies permits a more refined analysis of competitive effects on physician behavior.

C. FUNCTIONAL FORM AND ESTIMATION METHOD

Fee, utilization rate, and physician workload variables were regressed on the complete independent variable list using Ordinary Least Squares techniques. A semi-log functional form was used, by taking logs of all dependent variables, to capture nonlinear effects. Thus, coefficients can be interpreted as percent changes in the dependent variable attributable to unit changes in any independent variable. For 0, 1 dummies like board certification, coefficients would reflect average percentage differences in fees, intensity per patient seen, or workloads; for percentage variables like percent of population female, coefficients represent percent changes in fees, etc., due to one hundred percentage point increases in percentage rates (e.g., percent female increasing from .5 to 1.5); while for continuous monetary variables like wage rates, coefficients reflect percent changes attributable to $1.00 increases in the independent variable. As many coefficients were unduly small in absolute terms yet statistically significant, some variables have been further scaled per 1,000. For these variables the unadjusted coefficients can be derived by dividing by 1,000.

A direct test of demand inducement by physicians implies the use of simultaneous equation estimation techniques (like two stage least squares) to isolate pure demand from supply effects. Unfortunately, such software was unavailable, necessitating an indirect, reduced-form method (OLS).

This should be nearly as good, however, if we have accurately and comprehensively represented predetermining demand and supply factors. Nevertheless, using reduced-form methods is not as powerful a method for identifying shift effects as one that uniquely measures demand shifts alone. This is because the reduced-form coefficient for physician supplies will include both an inducement effect (if present) and an offsetting competitive effect. A negative coefficient, therefore, is consistent with positive inducement, with the net effect on fees still being negative. Positive coefficients, on the other hand, are completely unexplainable through competitive forces unless extensive nonprice competition (e.g., longer visits) is present. At bottom, a reduced-form estimation method provides a conservative test of inducement, and negative coefficients can be expected. Whether fees should have fallen even further with burgeoning supplies of physicians remains a legitimate area of investigation.

Regressions were run on several subgroups including: (1) a 20 percent sample of physicians (1,724 physicians) for the summary file, giving 8,620 physician-year data points; (2) separate analyses by specialist group (GPs/FPs, medical and surgical specialists); (3) by participation status (P1 = participating in both Blue Shield and taking assignment on more than 5 percent of claims; P3 = Blue Shield participating yet having less than 5 percent of Medicare claims assigned); and (4) 13 separate samples by individual procedure. Except for the 20 percent sample on the summary file (48,594 observations in all), all subgroups represent all physicians included in the group. The largest single subsample, 21,660 physician-years in all, included all PBS and

Medicare participating physicians while the smallest sample included physicians performing tonsillectomies (672 observations on 112 physicians).

D. ECONOMETRIC FINDINGS: SUMMARY FILE

Tables 6-10 and 6-11 present regression results from the six year longitudinal summary file. The first table of fees, utilization rates, and workloads, is based on a 20 percent sample of all specialties while the second table provides results on fees alone for general practitioners and medical and surgical specialists separately, plus two regressions for participants and nonparticipants. Only coefficients significant at least at the 10 percent level are shown, with five percent levels designated by an asterisk.

Considering Table 6-10 first, we note the superior explanatory power of the fee regression, as shown by the R^2 of .40 as compared to .12 and .18 for the utilization rate and workload equations, apparently due to the strong time trend in fees captured by the individual time dummies. In five years, weighted average fees rose approximately 33 percent, holding other trend factors like demographics and income constant. The biggest jump came in 1975 (9 percent), the year after wage/price controls were lifted. Since then, fees apparently rose 6-7 percent annually, ceteris paribus. Time trends for intensity and workloads were negative only for the last year or two of the study, no doubt attributable to declines in nonrepetitive surgery.

TABLE 5-10. REGRESSION RESULTS: SUMMARY FILE, FEES, UTILIZATION RATES, AND WORKLOADS

INDEPENDENT VARIABLES	DEPENDENT VARIABLE (IN LOGS)			
	WAFEE	WURT	WTOTS	VARIABLE MEANS
DEGREE	-.0307*	.3344*	.5389*	.89
BOARD	.0621*	-.2557*		.43
SP1	-.1266*	.8203*	.4384*	.37
SP2	-.0231	.7372*	.5124*	.26
SP3		.2720*		.33
YRSLIC	-.0073*	.0184*	.0703*	27.06
LICSQ (000)	.0590*	-.2761*	-1.4919*	863.71
POPURB (000)				78.73
POPMINOR	-.0057*		2.7855*	11.55
POPFEM		-.0868	-.2815*	52.38
POPLT5	-.0110			6.32
POPGT65	-.0126*		.1485*	12.23
POPDENSE (000)	.0114*			4113.01
SCHYRS				11.66
WORKUNEM	.0052			6.92
WORKLAB				4.72
POPPOV	.0104*		-.0818*	7.63
ADJPCINC (000)	.0170*			5427.96
HOSPBDS (000)			-.6071*	497.48
ADJDRWAG (000)	-.0021			13652.80
MEDAS (000)		1.7048*	4.9396*	55.74
MEDB (000)				22.96
METRODRS (000)		-.7339	1.4933*	162.07
GPPER				22.90
Y1 (1974)	.0529*			.17
Y2 (1975)	.1422*			.17
Y3 (1976)	.2060*			.17
Y4 (1977)	.2628*	-.1953*		.17
Y5 (1978)	.3308*	-.2433*	-.3595*	.17
P1 (P,A)	-.0291*	.4087*	1.1688*	.52
P2 (NP, NA)	.0280	.2130*	.2349*	.02
P3 (P, NA)	-.0210*		-.2058*	.15
CONSTANT	1.7890	5.51580	16.9380	
R^2	.40	.12	.18	
F(DOF)	177(8,589)	39(8,589)	59(8,589)	

TABLE 5-11. REGRESSION RESULTS: SUMMARY FILE, FEES BY SPECIALTY GROUP, PARTICIPATION STATUS

INDEPENDENT VARIABLES	SPECIALTY GROUP			PARTICIPATING STATUS	
	GPs/FPs	Medical Spec	Surgical Spec	Fully Participating	Medical Non-Participating
DEGREE	-.0628*	-.0297*	-.0178	-.0405*	-.0562*
BOARD	.0247*	.0709*	.0318*	.0425*	.0485*
SP1				-.1439*	-.0942*
SP2				-.5688*	-.1104*
SP3				-.0173*	.0593*
YRSLIC	-.0038*	-.0046*	-.0035*	-.0054*	-.0023*
LICSQ (000)				.0368*	-1.3882*
POPURB (000)	-.0051*	-1.365*			
POPMINOR			-.0050*		-.0079*
POPFEM	.0141*				
POPLT5	-.0169*				
POPGT65	-.0147*	-.0203*	-.0148*		-.0165*
POPDENSE (000)		.0065	.0152*	.0066*	.0100*
SCHYRS	-.0231*	-.0337*	-.0258*		
WORKUNEM	.0082*	.0105*	.0145*	.0178*	
WORKLAB	-.0067*	-.0247*	-.0162*	-.0082*	-.0297*
POPPOV		-.0082*		-.0074*	.0088*
ADJPCINC (000)			-.0182*	.0112*	
HOSPBDS (000)		.2452*	.1204*		.0204*
ADJDRWAG (000)	.0013*	-.0085*	-.0026*	-.0014*	-.0071*
MEDAS (000)		.3662*	.4191*	.5347*	.5436*
MEDB (000)		.3985	.5563*	.2704	.4754*
METRODRS (000)	.3265*		.1348*	.2971*	
GPPER	-.0023*	-.0039*		-.0012*	-.0040*
OWNMD		.0011*			
Y1 (1974)	.0301*	.0746*	.0571*	.0412*	.0758*
Y2 (1975)	-.0972*	.1367*	.1101*	.0677*	.1891*
Y3 (1976)	.1641*	.2140*	.1890*	.1382*	.2625*
Y4 (1977)	.2331*	.2860*	.2529*	.2042*	.3327*
Y5 (1978)	.2963*	.3698*	.3246*	.2683*	.3979*
P1	-.0143*	-.0103*	-.0488*		
P2	.0457*	-.0374*	.0627*		
P3	.0226*	-.1367*	.0254*		
CONSTANT	1.6920	2.0124	1.917	2.2371	1.4524
R^2	.37	.36	.33	.41	.38
F (DOF)	317(15,504)	217(11,759)	230(13,811)	512(21,630)	133(6,186)

Board-certified physicians in surgical and other specialties, along with D.O.s, charge higher fees per RVU than GPs or medical specialists, as evidenced by the negative coefficients for DEGREE, SP1 and SP2, together with the positive coefficient for BOARD and DEGREE. GPs, in particular, charge 12.7 percent less per RVU than surgeons and other specialists, or about 10.3 percent less than medical specialists, again holding many other factors constant. The source of this difference will be explored later.

Fees show a regular, rather than an inverted, U-shape relationship with work experience, but the fact that the curve "bottoms out" at 62 years of practice-since-licensure suggests that the relationship is really L-shaped and that fees are consistently lower for older cohorts. Thus, the uniformly falling relative fees as physicians grow older, observed in the descriptive work, is unaffected by confounding factors like specialization and location.

Population density and per capita income both raise fees as predicted, but other socio-demographic factors were less clear. Large minority populations apparently lower fees while poverty populations increase them. Possibly poverty status is a better proxy for health status than just minorities. Holding poverty constant, minorities may simply demand (or have access to) fewer physician services, choosing instead to use nonphysician and hospital outpatient services. Concentrations at both tails of the age distribution also apparently lower demand, which seems counterintuitive for the elderly who have greater medical need and extensive insurance coverage. High unemployment rates are also associated with higher fees which, if accepted at face value, may be attributable to lower worker time prices dominating lower incomes. The

variable may also proxy health status, Blue Shield insurance coverage, and other left-out variables. On the supply side, deflated wage rates physicians must pay for auxiliary personnel is negatively associated with fees rather than the other way around as predicted.

Neither direct patient care physicians per capita nor GPs per capita were significant in the summary fee equation. We interpret this to mean that, on an RVU basis, greater physician concentration does not result in competitively depressed fees for individual physicians in a market area. This is true holding physician credentials, years of experience, cost of living, demand and supply factors, and procedure intensity (RVUs) constant. Nonprice competition (e.g., longer visits, shorter waiting times, better quality surgeons) and greater reduced fees/bad debts in competitive areas may both explain this null finding. Nevertheless, the net result is higher reimbursements than would have occurred if fees were not rigid downwards in more competitive physician markets.

Fees for Blue Shield-participating physicians appear to be 2-3 percent lower than for nonparticipating, Medicare-assigning physicians (the excluded group) and 5-6 percent lower than joint Blue Shield-Medicare nonparticipants. Participating physicians may have stronger charity motives and keep fees lower, or they might take on more cases moving down along their private demand curve and lowering prices. Strict nonparticipators should have higher fees as private demand is very strong, ceteris paribus.

The annual average intensity of care per patient seen (about 3.35 RVUs, with a brief office visit = 1.0) clearly is associated with physician training and age although very little related to demographics,

which is somewhat surprising. D.O.s, non-board certified physicians and GPs would appear to provide the most care per patient seen when defined as RVUs across 23 types of procedures. A heavy concentration of brief and intermediate office visits per patient explains the high GP intensity rating, as shown later. Holding specialty and credentials constant, intensity per patient rises with physician work experience, essentially for the physician's working lifetime (or 33 years).

Intensity is also positively related to Medicaid payments per capita. It is impossible to say how much of this is due to greater Medicaid insurance coverage, poorer health status, or even a possible feedback effect of intensity on payments.

Physician concentration appears to be inversely related to intensity, as evidenced by the negative coefficient for METRODRS in column 2, Table 6-10. A strict prorating of patients with greater physician supplies would leave intensity unaffected; physicians would continue to see the same kinds of patients on average, performing similar procedures. Yet, the RVU-based workload coefficient for METRODRS is significant and positive (see column 3), implying more total output per physician, not less. Lower intensity per patient must be more than made up by greater unique patient contacts, which seems counterintuitive. The picture is one of more physicians seeing more patients in physician-dense areas, treating each less intensively on average. The most likely explanation of declining fees bringing forth greater numbers of patients is not supported by the fee regression, as noted previously, and other answers must be considered. Looking at individual procedure regressions may shed some light on this paradox.

Summarizing briefly the aggregate Blue Shield-Medicare physician workload equation, we find that:

- GPs and medical specialists provide more RVUs than surgical and other specialists;
- D.O.s have smaller Blue Shield-Medicare workloads;
- Younger physicians have heavier workloads, peaking at 23 years of work experience;
- Minority male and elderly populations increase physician workloads;
- Hospital beds reduce workloads;
- Medicaid payments raise workloads;
- Greater direct patient care physician supplies imply heavier Blue Shield-Medicare workloads;
- Fully participating physicians have greater workloads (which is not surprising given that workloads include only Blue Shield and Medicare patients); and
- Strictly nonparticipating physicians also have greater workloads (which cannot be attributed to claims data limitations).

Table 6-11 provides a slightly more disaggregated look at the fee equation alone. As GPs and FPs make up a large percentage of our sample (roughly 37 percent), it is not surprising that the fee equation for GPs/FPs alone is quite similar to the first one presented. The two notable differences are:

- Higher wage rates facing GPs/FPs lead to higher fees (rather than the opposite for the whole specialty sample); and
- Greater GP supplies appear to competitively lower fees per RVU while non-GP competition raises them.

The latter result is consistent with earlier findings (Steinwald and Sloan, 1974), reinforcing the notion of orthodox neoclassical markets -- at least for general practitioners. Why GP fees should be higher where there are more direct patient care physicians per capita is unknown, nor is it explained in earlier work. If specialists complement GPs through referrals, GPs could charge higher fees, but referrals are usually in the opposite direction, i.e., from GPs to specialists. Why greater specialist supplies should encourage GPs to charge higher fees, particularly when the former are likely being forced to carry out more routine care, thereby competing more directly with GPs, remains unexplained. In any event, the rapid decline in GPs nationally, given the nature of the market for GP services, would appear to have negative consequences for both GP and specialist fees.

The results for medical and surgical specialists, while similar to GPs in credentials, training, and work experience, differ in key respects. First, specialists' COL-adjusted fees tend to be higher in denser urban areas while no such effect was found for GPs. Second, unlike GPs, the level and distribution of per capita income affect specialists' fees; the higher is per capita income, the higher are surgeons' deflated fees, while fewer people in poverty is associated with higher medical specialists' fees. Third, total public program payments per capita (Medicaid and Medicare) are strongly related to specialists' fees: greater total payments, higher fees.

Competitive relationships also appear very different. For medical and surgical specialists, three physician-population ratios have been used; including METRODRS, GPPER, and OWNMD, the last of which reflects

the relative concentration of either medical or surgical specialists depending on the physician sample. For medical specialists, fees are unrelated to total physician supplies, positively related to medical specialists per capita (as evidenced by the positive coefficient on OWNMD), and negatively related to general practitioner supplies. An increase of 10 medical specialists per 100,000 (above a mean of 34) would, according to our results, lead to a $0.08 increase in their fees per RVU. The corresponding elasticity is .037 percent so that a 10 percent increase in medical specialist concentration would lead to a .37 percent increase in fees. Offsetting this to some extent would be any increases in GP concentration, which has a negative, competitive effect on medical specialist fees. The cross-price elasticity with respect to GP supplies is -.089. Holding the total number of direct patient care physicians (METRODRS) constant, 10 percent increases in both GPs and medical specialists per capita would be associated with declining fees. If specialists increased relative to GPs, however, then our results imply rising fees. Fee competition in the medical specialists market apparently comes not from direct, but interspecialty, pressures. Again, the declining proportion of GPs in physician supplies does not look good for future competition.

No such own- or inter-specialty competitive effects were found for surgical specialists. A statistically strong, positive correlation was found, however, between surgical fees and total physician supplies, although the elasticity is quite small (.02). This is partly consistent with earlier work by Steinwald and Sloan (1974, p. 506-7), although they show a negative own price elasticity for appendectomies (a procedure not

likely to be inducible). (Results on individual procedures are reported in the next section.) No evidence is found, therefore, for a competitive effect on surgeons' fees, in fact, just the opposite, which is particularly surprising given excess supplies in most areas.

Finally, the relationship between fees and physician participation status differs dramatically by specialty group (compare the P1, P2, and P3 coefficients in columns 1-3 of Table 6-11). Medical specialists differ from both GPs and surgeons in terms of fees when it comes to Medicare assignment. While non-assigning GPs and surgeons generally set higher fees, medical specialists are just the opposite. In fact, medical specialists who participate in Blue Shield but do not take assignment set fees 13.7 percent lower than non-participating, non-assigning physicians and 10 percent lower (.137 - .037) than fully nonparticipating (P2) physicians. Dual market theory predicts P2 physicians to set the highest fees, followed by P3, Blue Shield-only participating physicians, but evidently this is not the case. Intraspecialty differences may explain this anomaly, but this is unknown.

How does fee determination vary by physician participation in Blue Shield and Medicare? The last two columns of Table 6-11 provide fee models for fully participating (P1) and Medicare nonparticipating (P3) physicians, both of which can be contrasted against the entire sample of physicians in column 1, Table 6-10. We note, first, from a comparison of coefficients for Y5, the 1978 time dummy, that average fees per RVU have risen much faster for non-assigning physicians, holding all other factors constant. Over five years, non-assigning fees rose nearly 40 percent compared to only 27 percent for fully participating physicians, with most

of the difference coming in 1975, the year after wage-price controls were lifted. Average fees per RVU, however, were actually slightly lower for non-assigning physicians ($6.72 vs. $6.90 for fully participating physicians), implying that at least part of the differential in inflation rates reflects a catching up phenonemon. More rapid fee inflation of non-assigning physicians may also imply a relatively greater out-of-pocket burden for the elderly poor who must pay for fee increases above the Medicare allowable when the physician refuses assignment.

Another interesting comparison concerns the impact of Medicare Part B expenditures per capita on fees. Where expenditures are higher, physicians' fees are also higher, no doubt due to the insurance effect on demand. Yet, higher expenditures appear to have a stronger effect on non-assigning fees. A one dollar increase in Medicare expenditures per capita raises non-assigning fees per RVU by about $0.02 vs. less than a penny per RVU for fully participating physicians. While some of this effect may be due to a feedback effect of physician fees on Medicare Part B expenditures and, therefore, not strictly causal, it is indicative nonetheless of the higher costs to both the government and to patients of non-assignment.

Competitive effects appear similar to those already mentioned. A greater abundance of general and family practitioners appears to competitively depress charges, while more of all physicians in an area shows no competitive effects on charges. Indeed, for fully participating physicians, more non-GPs in an area per capita is associated with statistically higher fees per RVU, holding such things as broad specialty mix constant. Unfortunately, we do not know whether these charges

accurately represent transactions prices or if the physician is incurring large bad debts. Medicare-assigning physicians do have an incentive under CPR reimbursement to keep stated fees high, as they enter his charge profile and increase the probability of higher allowables in the future. If this is the case, we may be observing a quirk of the third party reimbursement system with physician competition a motivating factor, viz., more competition reducing revenues and encouraging physicians to raise stated fees for purposes of obtaining greater third party reimbursement in the future.

E. ECONOMETRIC FINDINGS: THIRTEEN PROCEDURES

Tables 6-12 and 6-13 present fee and utilization rate equations for 13 of the 23 individual procedures. The 13 include one diagnostic and 5 therapeutic surgical procedures; a chest x-ray; two kinds of office and one hospital visit; an EKG; and two pathology tests. All equations are specified as before, except that OWNMD has been dropped. Concentrating on competitive effects, Table 6-14 presents three coefficients from the fee and utilization equations reflecting the impact of inflation (Y5) and physician supplies (METRODRS and GPPER).

In terms of overall fee inflation, we have already shown in the descriptive results the relatively higher inflation for surgical procedures. We also find this for many individual procedures, holding income, insurance, and other demand and supply variables constant. Tonsillectomy fees exhibit the greatest increase over the period, 85.5 percent, followed by Colles fracture reductions at 71.4 percent, and

TABLE 5-12. (Page 1 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; FEES (IN LOGS)

INDEPENDENT VARIABLES	Colles Fracture	Tonsillectomy	Proctosig-moidoscopy	Herniorraphy
DEGREE	- .2157*		- .1124*	
BOARD				0.0712*
SP1			- .0493*	
SP2			.0711*	- .1890*
SP3				
YRSLIC	- .0226*	- .0193*	.0142*	.0118*
LICSQ (000)	.2841*	.2193*		- .2977*
POPURB (000)	5.5717*			1.9133*
POPMINOR		.0189*	.0140*	.0139*
POPFEM	- .4438*	.0613*		
POPLT5				.0425*
POPGT65	.0767*	- .0599*		.0221
POPDENSE (000)	.0283	.0546*		- .0228*
SCHYRS	.2567*	- .1499*		
WORKUNEM			.0378*	.0267*
WORKLAB		- .0367*	.0070	
POPPOV			- .0226*	- .0198*
ADJPCINC (000)	- .1738*	- .1155*		
HOSPBDS (000)	.3618*		- .0100*	
ADJDRWAG (000)		- .0075*		
MEDAS (000)			.6658*	1.875*
MEDB (000)				
METRODRS (000)		.4380		
GPPER	.0147*	- .0039*		
Y1 (1974)	.1128*	.1553*	.0304*	.0609*
Y2 (75)	.2686*	.3268*		
Y3 (76)	.4426*	.4960*	.1187*	.1723*
Y4 (77)	.5751*	.6201*	.1649*	.2355*
Y5 (78)	.7140*	.8549*	.2994*	.3165*
P1	.0487	- .0676*	.0285*	- .0323*
P2		.0789*		
P3		- .0792*	- .0494*	
CONSTANT	23.7403	4.9136	2.5726	7.1897
R^2	.4651	.61	.38	.4974
F(DOF)	19(518)	35(641)	74(3831)	36(984)

TABLE 5-12. (Page 2 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; FEES (IN LOGS)

INDEPENDENT VARIABLES	Lens Excision	OB Delivery	Chest X-Ray	Brief Office Visit
DEGREE			- .0698*	.0215*
BOARD	- .0225	.0274*		.0681*
SP1		- .2804*	- .1127*	- .1188
SP2			- .0334*	
SP3			- .0899*	
YRSLIC	- .0096*			- .0023*
LICSQ (000)	.0944*			- .0385*
POPURB (000)	-1.4902*	1.1946*	-2.6966*	.6113*
POPMINOR	- .0086*	- .0086*	.0163*	
POPFEM		.0363*	.0770*	- .0210*
POPLT5	- .0315*	.0335*	- .0768*	- .0183*
POPGT65		- .0171*	- .0647*	
POPDENSE (000)		.0221*	- .0273*	
SCHYRS	.0603*		.2286*	
WORKUNEM	.0285*	- .0069	.0298*	.0118*
WORKLAB		- .0108	- .0317*	
POPPOV		.0075	- .0244*	.0045*
ADJPCINC (000)		.0240*		
HOSPBDS (000)				
ADJDRWAG (000)	.0059*		- .0066	- .000003*
MEDAS (000)		.3655	.8485*	.0041
MEDB (000)		.0059		
METRODRS (000)				.2130*
GPPER			- .0025	- .0017*
Y1 (1974)		.0968*		.0461*
Y2 (75)		.2507		.1383*
Y3 (76)		.3440*		.2114*
Y4 (77)	.0824*	.4415*		.2625*
Y5 (78)	.1402*	.5224*		.3369*
P1	.0472*	- .0179	.0229	- .0075*
P2		- .0775*		
P3		.0378*		- .0159*
CONSTANT	6.0766	3.2042	3.0717	
R^2	.48	.6938	.2913	.3619
F(DOF)	42(1,231)	153(1,979)	18(1,275)	518(29,151)

TABLE 5-12. (Page 3 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; FEES (IN LOGS)

INDEPENDENT VARIABLES	Intermediate Office Visit	Intermediate Hospital Visit	EKG	Urinalysis
DEGREE		- .0939*	- .0874*	- .0493*
BOARD	.1011*	.0409*		.0865*
SP1	- .2462*	- .0621*	- .1053*	- .1934*
SP2	- .0702*	.0781*	- .0520*	- .0746*
SP3		.0530*		
YRSLIC	- .0021*	- .0041*	- .0028*	- .0183*
LICSQ (000)				.2240*
POPURB (000)	- .8015*	-1.4959*		
POPMINOR	.0049*		.0068*	
POPFEM	.0171*			
POPLT5	- .0231*	- .0227*		
POPGT65	- .0166*	- .0268*		
POPDENSE (000)		.0080*		
SCHYRS		- .0532*		
WORKUNEM	.0114*	.0173*	.0209*	.0108*
WORKLAB	- .0049	- .0228*	.0058	
POPPOV			- .0175*	
ADJPCINC (000)		.0187*		
HOSPBDS (000)		.1822*	- .0615*	
ADJDRWAG (000)	- .0021*			
MEDAS (000)	.1790		.2421*	
MEDB (000)	.1114*	.1825*		
METRODRS (000)	.1091	.3124*		.8180*
GPPER				- .0036*
Y1 (1974)	.0342*	.0347*	.0201*	.0280
Y2 (75)	.0770*	.0649*		.0493
Y3 (76)	.1446*	.1292*	.0671*	.1003*
Y4 (77)	.1966*	.1678*	.1274*	.1326*
Y5 (78)	.3012*	.2753*	.1774*	- .1837*
P1	- .0102*		- .2192*	
P_2	.1080*			.0717*
P3	- .0286*	- .0799*	- .0273*	
CONSTANT	1.7134	2.8367	2.9583	2.3094
R^2	.42	.27	.24	.18
F(DOF)	454(20,241)	177(15,381)	104(10,575)	50(6,987)

TABLE 5-12. (Page 4 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; FEES (IN LOGS)

INDEPENDENT VARIABLES	Complete Blood Count			
DEGREE	- .0391*			
BOARD				
SP1				
SP2				
SP3				
YRSLIC	- .0045*			
LICSQ (000)				
POPURB (000)				
POPMINOR				
POPFEM				
POPLT5				
POPGT65	- .0177*			
POPDENSE (000)				
SCHYRS				
WORKUNEM	.0128*			
WORKLAB	- .0306*			
POPPOV	.0199*			
ADJPCINC (000)				
HOSPBDS (000)				
ADJDRWAG (000)				
MEDAS (000)				
MEDB (000)				
METRODRS (000)	.2284			
GPPER				
Y1 (1974)	.0264			
Y2 (75)				
Y3 (76)	.0566			
Y4 (77)	.0763*			
Y5 (78)	.1180*			
P1				
P2	.0752*			
P3	.0238			
CONSTANT				
R^2	.1195			
F(DOF)	24(5,445)			

TABLE 5-13. (Page 1 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; URT (IN LOGS)

INDEPENDENT VARIABLES	Colles Fracture	Tonsillectomy	Proctosig-moidoscopy	Herniorrhaphy
DEGREE	- .4422*	- .4004*		.6676
BOARD		- .2022*	- .0726	.1067
SP1		-1.1833		
SP2			1.1085*	
SP3			1.2775*	
YRSLIC	- .0592*			
LICSQ (000)	1.1736*			.9356*
POPURB (000)		7.6060*	7.8543*	
POPMINOR	- .0527		- .0651*	.0454*
POPFEM	- .7564*	- .2975*		
POPLT5				.2540*
POPGT65	.3387*	.2010*	- .0523	.1119*
POPDENSE (000)		7.8784	.0801*	- .1480*
SCHYRS		.4219*	- .3315*	.2566*
WORKUNEM			- .0323	
WORKLAB	- .2078*	.2943*	- .0751*	
POPPOV		- .1140*	.0783*	.0724*
ADJPCINC (000)	- .3913*		.2508*	.2073*
HOSPBDS (000)	-1.2611*	-1.1902*		- .6187*
ADJDRWAG (000)	- .0381	.0321*		
MEDAS (000)		3.5887*	3.8767*	
MEDB (000)				
METRODRS (000)				
GPPER		- .0166*		.0123*
Y1 (1974)	.4779*	- .4971*		
Y2 (75)	.8156*	- .9373*		
Y3 (76)	.6937*	-1.2583*	- .2192	- .4223*
Y4 (77)		-1.3383*	- .4969*	- .5130*
Y5 (78)		-1.9562*	- .7121*	- .7387*
P1	.6497	- .1509*	- .3023*	
P_2			.4620*	
P3		.6115*		.4693*
CONSTANT	33.5745	5.5660	3.0219	-7.3301
R^2	.2138	.36	.12	.1684
F(DOF)	6(518)	14(641)	18(3,831)	8(984)

TABLE 5-13. (Page 2 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; URT (IN LOGS)

INDEPENDENT VARIABLES	Excision of Lens	OB Delivery	Chest X-Ray	Brief Office Visit
DEGREE	.5356*	.3536*	.6624*	- .3669*
BOARD			- .1813*	- .6626*
SP1		- .7939*	- .6539*	.4594*
SP2				- .3797
SP3				- .7116*
YRSLIC		.0229*		.0175*
LICSQ (000)	- .3433	- .5300*		
POPURB (000)	3.8584		12.1965*	
POPMINOR			.0674*	.0276*
POPFEM	- .1347*			.1082*
POPLT5		.0711	.1731	.1842*
POPGT65	.1089*		.2071*	
POPDENSE (000)				- .0291*
SCHYRS				- .4333*
WORKUNEM	- .0355	.0301*		
WORKLAB	.1480*			- .0515*
POPPOV	- .0420			- .0630*
ADJPCINC (000)			.1843	
HOSPBDS (000)		- .4672*	-1.4367*	.4381*
ADJDRWAG (000)				- .00002*
MEDAS (000)		1.5060*		- .0241*
MEDB (000)				
METRODRS (000)	-1.2888*	.1179*		
GPPER		- .0111*	.0392*	- .0071*
Y1 (1974)				
Y2 (75)				.1379*
Y3 (76)				
Y4 (77)		- .3106*		
Y5 (78)		.3503*	- .6596	
P1		- .2401*	.1747*	- .5189*
P2				.2657*
P3				.3353*
CONSTANT	1.5474	-4.9124		
R^2	.29	.2521	.0968	.2986
F(DOF)	19(1,231)	24(1,979)	5(1,275)	389(29,151)

TABLE 5-13. (Page 3 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; URT (IN LOGS)

INDEPENDENT VARIABLES	Intermediate Office Visit	Intermediate Hospital Visit	EKG	Urinalysis
DEGREE		- .1268*		
BOARD	.2852*	- .1257*		
SP1	.3326*	.4274*		.3764*
SP2	.1781	.8557*	.4151*	.3022*
SP3	- .6680*	- .9152*	- .6270*	.5547*
YRSLIC	.0113*		.0157*	.0125*
LICSQ (000)	.1626*		- .1883*	.1797
POPURB (000)	2.4826*	8.3046**	2.2742*	
POPMINOR			.0183*	
POPFEM		- .0782*		- .1522*
POPLT5		.1236*	- .1155*	- .0901*
POPGT65		.0816*	- .0619*	
POPDENSE (000)				.0575*
SCHYRS		.3996*		
WORKUNEM	.0576*		.0392*	
WORKLAB	.1360*	.1094*		- .0656*
POPPOV				
ADJPCINC (000)			.1669*	.0895*
HOSPBDS (000)	- .4187*	- .8357*	- .3957*	
ADJDRWAG (000)				
MEDAS (000)	1.9347*	3.7959*		
MEDB (000)				
METRODRS (000)		- .9500*	- .6032	
GPPER	.0046	.0104*	.0066*	
Y1 (1974)	.2774*	.1145*	- .0746*	
Y2 (75)	.1245	.1320	- .2406*	.2729*
Y3 (76)			- .4195*	
Y4 (77)			- .5669*	
Y5 (78)			- .6744*	
P1	- .3299*	.2553*	.0500*	
P2		- .5737*	.1923*	.2735*
P3	.2341	- .6361		
CONSTANT	-1.9881	-4.1899	-2.5113	5.6381
R^2	.18	.23	.16	.10
F(DOF)	138(20,241)	148(15,381)	64(10,575)	25(6,987)

TABLE 5-13. (Page 4 of 4)

REGRESSION RESULTS: INDIVIDUAL PROCEDURE FILES; URT (IN LOGS)

INDEPENDENT VARIABLES	Complete Blood Count			
DEGREE	- .1559*			
BOARD				
SP1	- .3918*			
SP2				
SP3	- .5444*			
YRSLIC	- .0281*			
LICSQ (000)	.5775*			
POPURB (000)				
POPMINOR				
POPFEM				
POPLT5	- .1671*			
POPGT65				
POPDENSE (000)				
SCHYRS				
WORKUNEM	.0588*			
WORKLAB	- .0788*			
POPPOV	.0885*			
ADJPCINC (000)	.2517*			
HOSPBDS (000)	.6364*			
ADJDRWAG (000)	.0164			
MEDAS (000)				
MEDB (000)				
METRODRS (000)	-2.0093*			
GPPER				
Y1 (1974)				
Y2 (75)				
Y3 (76)	- .2770*			
Y4 (77)	- .3456*			
Y5 (78)	- .5168*			
P1	- .1356*			
P2	- .2353*			
P3	.2528*			
CONSTANT				
R^2	.0945			
F(DOF)	19(5,445)			

TABLE 5-14. PHYSICIAN COMPETITION AND INFLATION FOR FEE UTILIZATION EQUATIONS -- 13 SELECTED PROCEDURES

	%Δ --1973-78(Y5)--		--METRODRS---		---GPPER----	
Procedure	Fees	URT	Fees	URT	Fees	URT
SURGERY:						
Colles Fracture	71.4%	---	---	---	.0147	---
Tonsillectomy	85.5	-195.6%	.438		-.0039	-.0166
Proctosigmoidoscopy	29.9	- 71.2	---	---	---	---
Herniorrhaphy	31.7	- 73.9	---	---	---	.0123
Lens Excision	14.0	---	---	-1.289	---	---
Vaginal Delivery	52.2	35.0	---	.1179	---	-.0111
DIAGNOSTIC:						
Chest X-Ray	---	- 66.0	---	---	.0025	.0392
EKG	17.7	- 67.4	---	- .6032	---	.0066
VISITS:						
Brief Office Visits	33.7	---	.213	---	-.0017	-.007
Intermediate Office	30.1	---	.109	---	---	.0046
Intermediate Hospital	27.5	---	.312	- .95	---	.0104
PATHOLOGY:						
Urinalysis	18.4	---	.818	---	-.0036	---
CBC	11.8	- 51.7	.228	-2.01	---	---

obstetrical deliveries at 52.2 percent. The diagnostic and pathology tests showed the lowest rates of fee increases, ranging from zero percent for chest x-rays to 18.4 percent for a urinalysis. Office and hospital visits were between surgery and testing in terms of inflation. It must be remembered that these changes represent increases over and above those explained by time trends in income, and Medicare-Medicaid payments per capita, which undoubtedly reflect average inflation levels to some extent. For some procedures to be showing such high inflation rates under these circumstances is unexpected.

The effects of physician supplies on fees clearly depend on physician specialty mix and type of procedure. Holding the number of GPs constant, no evidence is found of lower fees in more competitive physician areas. All six of the 13 coefficients for METRODRS that were statistically significant were positive, implying higher, not lower fees in areas with more specialists per capita. More GPs, by contrast, do appear to act as a competitive break on fees, at least in four out of five instances where GPPER was significant.

In those cases where METRODRS was positively related to fees, it was for patient visits and pathology test primarily, with the notable exception of tonsillectomies. Most surgical procedures, chest x-rays, and EKGs showed no relationship to physician concentration. Given the general oversupply of surgeons, it is surprising that more price-competitive behavior is not observed for such simple procedures as tonsillectomies and herniorrhaphies.

Among the surgeries, fractures and deliveries were originally selected because they should be less subject to physician inducement, and

individual physician demand should be a simple proration of aggregate area need. Yet, neither of these procedures exhibit any competitive effects in terms of fees; indeed, GPPER is positively related to average fees for fracture reductions.

Reinhardt (1978) has hypothesized that physicians would be more likely to induce services that are not intensive users of their time. Thus, if inducement exists, it is most likely to be evidenced with radiology and pathology procedures. Our results provide some evidence for this hypothesis, but only for pathology. Charges for urinalyses appear to be especially inducible. A coefficient of .818 for METRODRS in the fee equation is associated with an elasticity of .15; a ten percent increase in the number of physicians per capita results not in a fall, but an increase in urinalysis charges of 1.5 percent. This is true holding specialty, geographic cost-of-living, and other factors constant.

Turning, finally, to competitive effects on visits, a positive correlation of physician supplies and fees is discovered for all three visit types. Apparently, non-GP physicians with similar credentials charge higher visit fees in areas with more direct patient care physicians per capita. This is true for brief office visits, for intermediate office visits, and for intermediate hospital visits as well. Because we are unsure of the exact content of these visits, care must be taken in citing this as prima facie evidence of inducement. Physicians may be engaged in various forms of nonprice competition (e.g., longer visit lengths, nicer waiting rooms) in areas where their colleagues are more plentiful. Whether this can turn the signs of these coefficients around, however, is doubtful. (For the rather marginal effects of amenities on fees see Sloan

and Lorant (1976, 1977) and Sloan (1980)). Nor can we be certain that physicians in more competitive areas are paid in full; reduced fees and bad debts may well explain at least part of their higher stated charges. But if this is the case, why don't they keep charges more in line with what patients are willing to pay? Possibly for reimbursement purposes? UCR modes of reimbursement may be more extensive in physician-dense areas, contributing to the incentive to keep fees high. Physicians apparently are successful in this regard, as we have already seen in earlier comparisons of fees and Blue Shield/Medicare payments. If this is the case, however, public programs using CPR reimbursement would not enjoy the advantages of greater competition as payments are based on stated, not transactions, prices.

REFERENCES

American College of Surgeons (ACS), Surgery in the U.S., A Summary Report of the Study on Surgical Services for the United States, 1975.

Auster, Richard, and R. Oaxaca, "Identification of Supplier Induced Demand in the Health Care Sector," Journal of Human Services, Vol. XVI, No. 3, Summer 1981, pp. 327-342.

Bureau of Health Manpower, The Target Income Hypothesis (Jesse Hixon, ed.). U. S. Department of Health, Education, and Welfare; Health Resources Administration, Publication No. (HRA) 80-27, 1980.

Coterill, Philip G., "Relative Changes in Physicians' Fees: Evidence From the Consumer Price Index," in Profile of Medical Practice, 1978 (J. Gaffney, ed.). Monroe, Wisconsin: American Medical Association, 1979, pp. 55-70.

Davis, Karen and Roger Reynolds, "The Impact of Medicare and Medicaid on Access to Medical Care," in Richard N. Rosseh (ed.) The Role of Health Insurance in the Health Services Sector, New York: National Bureau of Economic Research, 1976, pp. 391-435.

Dyckman, Zachary, Physicians. A Study of Physicians' Fees, Washington D.C.: Council on Wage and Price Stability, March, 1978.

Evans, R. G., "Beyond the Medical Market Place: Expenditure, Utilization, and Pricing of Insured Health Care in Canada," in The Role of Health Insurance in the Health Services Sector (Rosett, ed.) New York, National Bureau of Economic Research, 1976, pp. 437-492.

Feldman, Roger, "Price and Quality Differences in the Physicians' Services Market," Southern Economic Journal, 45:885-91, January 1979.

Feldman, Roger and James Begun, "The Effects of Advertising Lessons From Optometry," The Journal of Human Resources, XIII (Supplement): 247-262, 1978.

Feldstein, Martin S., "The Rising Price of Physicians' Services." The Review of Economics and Statistics, Vol. LII, No. 2, May 1970, pp. 121-133.

Fuchs, Victor R., "The Supply of Surgeons and the Demand for Operations," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 35-56.

Fuchs, Victor R., and Marcia J. Kramer, Determinants of Expenditures for Physicians' Services in the United States 1948-1968. National Center for Health Services Research and Development; DHEW Publication No. (HSM) 73-3013, December 1972.

Fuchs, Victor and Joseph Newhouse, "The Conference and Unresolved Problems," Journal of Human Resources, Vol. XIII, Supplement, 1978, pp. 5-20.

Gabel, Jon, "Analysis of Third Party Payment Levels: Technical Appendix, Chapter 5, Cost-of-Living Adjustment," in Institute of Medicine, Social Security Studies: Final Report, Part IV, Medicare-Medicaid Reimbursement Policies, July, 1976.

Gibson, Robert M. and Daniel R. Waldo, "National Health Expenditures, 1980," Health Care Financing Review, Vol. 3, No. 1, September, 1981.

Green, Jerry, "Physician-Induced Demand for Medical Care," The Journal of Human Resources, Vol. XIII, Supplement 1978, pp. 21-34.

Grittelsohn, Alan and John Wennberg, "On the Incidence of Tonsillectomy and Other Common Surgical Procedures," in John Bunker et al. (eds.), Costs, Risks, and Benefits of Surgery, (New York: Oxford University Press, 1977), pp. 91-106.

Hadley, Jack, and Robert Lee, "Physician Price and Output Decisions: Theory and Evidence." Urban Institute, Working Paper 988-8, Washington, D. C., April 1978.

Health Care Financing Administration (HCFA), "Determination of Reasonable Charges Under Part B of Medicare - A Basic Text," Washington D.C.: GPO, September, 1977.

Health Resources Administration (HRA), The Current and Future Supply of Physicians and Physician Specialists, DHHS/HRA/Pub. No. (HRA) 80-60, 1980.

Held, Philip, and L. Manheim, "The Effect of Local Physician Supply on the Treatment of Hypertension in Quebec." In The Target Income Hypothesis, (Jesse Hixon, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 44-59.

Hirshleifer, Jack, Price Theory and Applications, Second Ed., Englewood Cliffs: Prentice-Hall, 1980.

House, Donald R., "Conflicting Theories of the Determination of the Entrepreneur's Income: An Analysis of the Practicing Dentist." In The Target Income Hypothesis (Jesse Hixon, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 83-92.

Juba, David A., "Price Setting in the Market for Physicians' Services: A Review of the Literature," U. S. Department of Health, Education, and Welfare, HEW Publication No. (HCFA) 03012, September 1979.

Lee, Robert H., and Jack Hadley, "Physicians' Fees and Public Medical Care Programs," Health Services Research, Vol. 16, No. 2, Summer 1981, pp. 185-204.

McLean, Robert A., "The Structure of the Market for Physicians' Services," Health Services Research, Vol. 15, No. 3, Fall 1980, pp. 271-280.

Mitchell, Janet B., and Jerry Cromwell, Physician Induced p Demand for Surgical Operations. Final Report submitted under HCFA Grant 95-P-97245-01, December 1980.

Mitchell, Janet B., and Jerry Cromwell, Physician Behavior Under the Medicare Assignment Option. Final Report submitted under HCFA Contract No. 500-78-0051, January 1981.

National Center for Health Statistics, Surgical Operations in Short-stay Hospitals, United Stated, 1968, Vital and Health Statistics, Series 13, No. 11, January, 1973, 1977 (unpublished).

Paringer, Lynn, "The Medicare Assignment Rates of Physicians: Their Responses to Changes in Reimbursement Policy," Health Care Financing Review, 1:75-89, Winter 1980.

Pauly, Mark and Mark Satterthwaite, "The Effect of Provider Supply on Price" in Jesse Hixson (ed.), The Target Income Hypothesis, DHEW/HRA/DMA/, No. (HRA) 80-27, 1980, pp. 26-36.

Pauly, Mark V., and Mark A. Satterthwaite, "The Pricing of Primary Care Physicians' Services: A Test of the Role of Consumer Information," Bell Journal of Economics, Vol. 12, No. 2, Autumn 1981, pp. 488-506.

Ramsey, James B., "An Analysis of Competing Hypotheses of the Demand for and Supply of Physician Services." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 3-20.

Redisch, Michael, J. Gabel, and M. Blaxall, "Physician Pricing, Costs and Income," preliminary paper prepared for Western Economic Association Meetings, Anaheim, California, June 1977.

Reinhardt, U., "A Production Function for Physicians' Services," The Review of Economics and Statistics, Vol. 54, February 1972, pp. 55-56.

Reinhardt, Uwe E., "Comment (on the Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 121-148.

Roehrig, Charles S., "A Formal Model of Target Income Pricing with Supplier-Induced Demand." In The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 21-15.

Saving, Thomas R., "Discussion," in The Target Income Hypothesis (Jesse Hixson, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 99-100.

Sloan, Frank, "Physicians' Fees and Length of Visit," Chapter 3, An Analysis of Survey Data on Physician Practice Costs and Incomes. Final Report, HCFA Contract No. 500-78-0018, April 1981.

Sloan, Frank A., "Discussion," in The Target Income Hypothesis (Jesse Hixon, ed.), DHEW/HRA/DMA, Publication No. (HRA) 80-27, 1980, pp. 93-95.

Sloan, Frank A., "Physicians and Medicaid," Analysis of Survey Data on Physician Practice Costs and Income. Final Report submitted to HCFA, DHEW under contract No. 500-78-0018, September, 1979, pp. 21-28.

Sloan, Frank A., "State Discretion in Federal Categorical Assistance Programs: Analysis of Variations in Medicaid Payments for Physicians' Services," Contract No. 500-78-0018, September, 1979.

Sloan, Frank et al., An Analysis of Determinants of Health Care Utilization: Preliminary Report for Area 2: Market Conditions and Provider Response, DHEW/HRA/BHM, January, 1980.

Sloan, F., J. Cromwell, and J. Mitchell, "Physician Participation in State Medicaid Programs," Journal of Human Resources, Vol. 13: 211-45, Supplement, 1978.

Sloan, Frank A., and Roger Feldman, "Competition Among Physicians." In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 45-102.

Sloan, F. A. and R. Feldman, "Monopolistic Elements in the Market for Physicians' Services," in W. Greenberg (ed.) Competition in the Health Care Sector: Past, Present and Future, Proceedings of a conference sponsored by the Federal Trade Commission, March, 1978, pp. 57-131.

Sloan, Frank and John Lorant, "The Allocations of Physicians' Services: Evidence on Length of Visit," Quarterly Review of Economics and Business 16, Autumn 1976: 85-103.

Sloan, Frank A. and John H. Lorant, "The Role of Waiting Time: Evidence from Physicians' Practices," The Journal of Business of the University of Chicago, Vol. 50, No. 4, October, 1977, pp. 486-507.

Sloan, F., Wisniewski, and Guterman, "An Anlaysis of Determinants of Health Care Utilization," preliminary report under HEW Contract No. HRA 232-78-0138, January 1980.

Stano, Miron, "The Pricing and Utilization of Physicians' Services," Paper presented at EEA meetings in Washington, D. C., April 1978, pp. 1-19.

Steinwald, Bruce and Frank A. Sloan, "Determinants of Physicians' Fees," Journal of Business, Vol. 47, October, 1974, pp. 493-511.

Sweeney, George, "Determinants of Physicians' Earnings: An Empirical Test of the Target Income Model," Appendix E to Final Report under HCFA Contract NOo. 500-78-0018, September 1979.

Vahovich, Steven G., "Physicians' Supply Decisions by Specialty; 2565 Model," Industrial Relations, Vol. 16, No. 1, February 1977, pp. 51-60.

Yett, Donald E., "Comment" (on Sloan and Feldman, "Competition Among Physicians"). In Competition in the Health Care Sector (Warren Greenberg, ed.). Germantown, Maryland: Aspen Systems Corporation, 1978, pp. 103-120.

Yett, Donald et al., "A Model of Physician Pricing, Output, and Health Insurance Reimbursement: Findings From Study of Two Blue Shield Plans Claims Data," working paper (HCFA Contract No. 600-76-0160), 1980.

FINAL REPORT ON

A STUDY OF THE PHYSICIANS' SERVICES MARKET IN PENNSYLVANIA

Part Six:

Assessment of Alternative Reimbursement System Designs

By: Gene A. Markel
David P. Etnoyer
Susan Bunting Bianchi

I. INTRODUCTION

A number of health insurance carriers and programs, including the Medicare Part B program and Pennsylvania Blue Shield, make reimbursement on claims for physicians' services through the "usual, customary, and reasonable" (UCR) approach. This approach also is sometimes known as "customary, prevailing, and reasonable" (PCR) -- in the Medicare program, for instance. For present purposes, this report will adopt the convention of calling it UCR.

UCR emerged in the middle and late 1960's. It was devised and implemented with the intention of providing a reimbursement system for insured physicians' services that would pay as close as possible to current market prices for services, that would keep pace with inflation, and that would be as fair as possible to all involved. Briefly, the UCR system approaches this by keeping on file individual doctors' "usual" charges for all kinds of specific services on which they report claims with reasonable frequency, while also maintaining a file of the "customary" charges for several peer groups of physicians. The term "customary" here is somewhat of a misnomer. The so-called customary charge actually serves the purpose of defining a cut point beyond which a physician's charge would be considered excessive, even if it is within the range of his usual charge. The typical rule is for a physician's usual charge to be defined as the median of the actual billed charges reported during a recent time period, and for the customary to be defined as the value at some specified percentile of the distribution of usual charges for all physicians comprising a peer group. The system adjudicates a

reimbursement allowance on a UCR claim by allowing as "reasonable" the smallest of: (a) the physician's actual billed charge showing on the claim; (b) his own usual charge of record; or (c) the recorded customary charge for his peer group. Provision is made for special reviews on claims alleged to be for cases in which there were unusual or extenuating clinical circumstances to justify greater than usual payment. The files of usual and customary charges, generally referred to as "profiles," are updated periodically.

The language and terminology, incidentally, are different for Medicare than for most Blue Shield systems. Blue Shield UCR refers to the individual physician's "usual" charge and the peer group's "customary" charge, whereas Medicare refers to the individual doctor's "customary" charge and the peer group's "prevailing" charge. To minimize confusion that could arise with this terminology, some subsequent portions of this report will refer to the individual doctor screen as the Level I charge screen, and to the peer group screen as the Level II.

A. SUMMARY OF PROBLEM

In the application of these stated UCR principles and objectives, there are a number of points where administrative discretion has to be exercised. More fundamentally, there are also a number of basic design options open for the system. A comparative review and investigation of all areas of administrative discretion and design option would be beyond the intended scope of this project, however. The present investigation is limited primarily to an exploration of some of the alternatives that could

be used in designing and applying peer group structures as they would relate to the determination of Level II charges.

In general, physician peer groups for reimbursement purposes are defined on the basis of the physician's specialty and location of practice. Analyses of physicians' charges tend to confirm the intuitive belief that the location of a physician's practice and his field of specialization have some bearing upon his charging practices, although the relative importance of these factors varies somewhat from situation to situation and is difficult to quantify. The relationship of area and specialty to physicians' charges has direct implications for the design of reimbursement mechanisms, specifically with respect to the grouping of physicians into area and specialty classes for the purpose of calculating the "prevailing" charges which then are used to determine fee allowances under UCR reimbursement systems. A variety of strategies could, and have, been used by Medicare carriers and private insurers to classify physicians' charges by area and/or specialty for these purposes.

The exact manner in which one chooses to recognize and group specialties to define peer groups for reimbursement is a matter of considerable consequence, as is the definition and use geographic area breakdowns for the same purpose. In general, the operative questions are: Should specialties be recognized, or should all physicians be put in the same pool for reimbursement? If specialties are recognized, should <u>all</u> specialties be acknowledged, or should they be recognized simply in more-or-less homogeneous broad groupings? Should differences in practice locale be taken into consideration, or should all physicians throughout the carrier's (insurer's) geographic service area be grouped together? If

geographic area is recognized, exactly how should the area breakdowns be defined? These are basic design questions; and it is generally accepted, at least intuitively, that the manner in which these design questions are resolved will have an impact -- perhaps a substantial impact -- upon a carrier's (or insurer's) general levels of reimbursement. It should be obvious that the ramifications extend into such areas as program benefit costs, administrative costs, cost containment, and general equity of the reimbursement system.

In addition, it may be noted that these issues and questions have taken on added importance (and have attracted considerably more interest) in recent years, as medical care price inflation has increased and as program costs have become more and more difficult to contain.

B. OUTLINE OF STUDY AND REPORT

A number of basic design options have been specified, spanning some of the principal categorical choices for the use of physician specialties and/or geographic areas in the design of peer groups to be used in determining customary charges in a UCR system. The options to be examined are identified and defined in Section III.A. The approach taken is to simulate the payment (or allowance) adjudications that would be made under each option and accumulate statistics on the comparative payouts and other performances of the various options. The technical approach is described in general overview in Section III, and the simulation methodology itself is described in greater detail in section IV. Findings are presented and discussed in Sections V, VI, and VII.

II. GENERAL BACKGROUND

A. MEDICARE REIMBURSEMENT IN PENNSYLVANIA

Medicare reimbursement systems, as well as most Blue Shield systems, involve the use of two levels of screens to limit the amount of a doctor's claimed charge that is deemed allowable (i.e., before the application of coinsurance and deductibles). The first level screen is the individual doctor's "customary charge" (Level I), which for Medicare is computed at the fiftieth percentile of his charges in the profile data base, although various other computational formulas are used by Blue Shield Plans for their regular business systems. The alternatives under consideration in this study are not concerned with variations in the customary charge calculation. However, some of the alternatives to be examined here do involve a complete deletion of this level of screening. In some cases the use of customary charge screens may unfairly penalize established doctors or doctors who have foregone fee increases for an extended period of time. Meanwhile, new doctors who have not yet established Level I charges and doctors who raise their fees more rapidly are effectively limited only by the second level of fee screens -- the prevailing charges (Level II).

1. Area Differentiation

Prevailing fee screens are intended to reflect the charges of physicians with similar training and background. Typically, they are stratified by some type of specialty classification and, in some cases, by geographic area as well. Pennsylvania Blue Shield assigns doctors (by

specialty) to reimbursement peer groups according to four "charge classes," designed to recognize socioeconomic distinctions between different geographic areas. The four charge classes used in Pennsylvania partition the state as follows: (1) those sections of Philadelphia and Pittsburgh (Pennsylvania's two largest cities) which are in the vicinity of teaching hospitals, and which generally command the highest fees; (2) the remainder of the above cities and other principal metropolitan areas; (3) lesser metropolitan areas; and (4) areas that are essentially rural in nature.

The current charge class structure was designed in 1970 to group areas that, while not necessarily contiguous, are similar in terms of demographics and physician fee levels. With only four categories, however, there is necessarily much variation within any given charge class, both in demographics and in physicians' charging practices; and patterns in these factors doubtless have changed somewhat since 1970. To expand the number of charge classes or to modify their structure would complicate the administration of the system, by increasing file sizes and the frequency of perceived inequities. Also, physicians, carriers (or insurers), and the federal government tend to be wary of changes, since the effects appear uncertain and can be confusing to those who must interact with the system. Because the geographic distinctions are obscure and variable, the general effectiveness of the charge class structure is often suspect. Several of the options simulated in this study analyze alternatives in which the prevailing charges are not stratified geographically. Prior data suggests that this should have the effect of raising payments slightly in rural areas and lowering them in the major

metropolitan areas. If the effects are not too drastic, this could provide a desirable incentive for doctors to practice in underserved rural areas.

2. Specialty Differentiation

Of the more than sixty specialty categories used by Pennsylvania Blue Shield, approximately thirty specialties account for the vast majority of claims received by Pennsylvania Blue Shield for physicians' services, with the other categories representing mostly less populous sub-specialties and non-physician suppliers of medical commodities. The number of sub-specialties has expanded rapidly in the past decade, as technology and the degree of specialization have developed. Physicians frequently expect that recognition of a sub-specialty in the prevailing fee profiles will generate higher fee and payment allowances than those commanded by the more broadly defined major specialties. However, the actual charges submitted by many specialists (which ultimately determine their profiles) may in some cases be no higher, or even lower, than those of generalists; and it is questionable how much differential in allowances is either justifiable or practical for the "super-specialists."

Also, certain specialty categories may be somewhat redundant, since type service/procedure terminology tends to delineate and differentiate the major areas of practice of each specialty. Therefore, it is debatable whether the increased proliferation of specialties should continue to be recognized in prevailing fee profiles. The models to be employed in this study will address alternatives wherein no specialty differentiation is made in the prevailing charges, and will also address

variations using only four broadly defined specialty categories. The four alternative specialty groups are defined as follows: (1) general and family practitioners; (2) medical specialists; (3) surgical specialists; and (4) "other" specialists, such as anesthesiologists, pathologists, radiologists, etc.

B. BASIC ISSUES

As suggested in Section I.A, the principal design issues with regard to this aspect of a UCR system ultimately center upon the questions of whether -- and if so, how -- to deal with specialty and geographic area differences. To speak to that, this study essentially focuses upon various degrees and combinations of both specialty and area recognition. There are many who feel that it might be advantageous to eliminate Pennsylania's four charge classes, but it is not really clear what the result of this might be. Similarly, although there are some who feel that specialties should not be recognized and that all doctors should be lumped in the same pool, there is great uncertainty about how this would work out if tried. In addition, there has been growing interest in the possibility of abandoning UCR altogether, and replacing it with some kind of fee schedule. If the fee schedule option were ever adopted, however, the question of what to do about area and specialty differences would still remain.

The basic impacts of interest in considering the various options are the changes that might be seen in total payment allowances, in the proportions of billed charges that would be paid, in the number of claims

that would be paid in full, and in the beneficiary liability. Further, the effects surely would have differing impacts upon different specialties, upon different generic types of service, and in different areas. Again, however, it is very unclear just how the impacts of various design options would be distributed along some of these dimensions.

Beyond these basic issues and considerations, there are also a few special areas of interest. Two of these, involving actual or proposed administrative interventions, are discussed briefly in the following two subsections.

C. MEDICARE ECONOMIC INDEX

The Medicare Economic Index (MEI) is a cumulative figure representing changes in physicians' practice costs and changes in general earnings levels. It is intended to act in establishing a ceiling on increases in prevailing charges for physicians' services. The MEI has been applied in Medicare profile calculations since 1976.

The MEI is based on increases since 1971 in the costs of physicians' office practices and in the earnings level of workers in general. As a result of the economic index limitation, increases in prevailing charges for physicians' services above those of fiscal year 1973 (which were based on calendar year 1971 charge data) can be allowed only if they can be justified on the basis of economic changes. The MEI limitation was added to the reasonable charge process in 1972 by Public Law 92-603 to assure that physician reimbursement under Medicare would follow rather than lead inflation.

It is believed that the use of this indexing process has produced some improvement in the application of UCR reimbursement mechanisms. Still there are a number of practical questions and policy issues surrounding the MEI. It is not really clear just exactly what detailed effect may be attributed to the MEI in many instances. There are some who feel that the use of a single index is not equitable, because of different effects upon different physician specialties. Others argue against specialty-specific indexes. Some of the reimbursement system design options examined in this study are designed to provide an assessment of the effects of indexing.

D. PROPOSED TALMADGE AMENDMENT

Senator Talmadge, in 1975 and 1976, went through several stages of drafting and attempting to introduce and obtain support for legislation aimed at accomplishing a comprehensive Medicare-Medicaid reform. The initial bill was large and complicated, and was directed largely toward fraud and abuse problems. Great difficulty was encountered in gaining acceptance for the bill, and in subsequent efforts the emphasis was shifted more to cost containment. The several interim shifts and developments ultimately led to the so-called Talmadge Amendment, which was proposed in a recent past session of Congress, and which would limit fee increases to not more than one-third above the statewide median fee for a service. As stated in the Senate Finance Committee report (December 10, 1979), "The bill provides for the calculation of statewide median charges (in any State with more than one locality) in addition to prevailing

charges in the locality. To the extent that any prevailing charge in a locality was more than one-third higher than the statewide median charge for a given service, it would not be automatically increased each year. This provision would not reduce any prevailing charges currently in effect. However, it would operate, to the extent given charges exceed the statewide average by more than one-third, to preclude automatically increasing those charges."

As a representative type of allowance-limiting feature, this sort of provision continues to be of interest, even though the Talmadge Amendment itself may never come to pass. A design option has been included in the study to determine and to assess some of the effects that may be associated with the proposed Talmadge limitations.

III. OVERVIEW OF APPROACH AND STUDY DESIGN

Alternative physician reimbursement system designs are tested and assessed in this study by simulating the claims payment process under a number of parametric variations designed to reflect and to capture some of the principal payout effects of a variety of reimbursement system options. Basically, the simulation process involves passing a representative sample of actual past claims experience against an artificially constructed model of an alternative reimbursement mechanism (including appropriately constructed synthetic pricing tables or doctors' profiles) and "pricing" each claim at the lesser of the billed charge or the amount hypothetically specified in the applicable allowed charge screens (customary and prevailing charges). Changes in the reimbursement system are analyzed by passing a static base of claims against the alternative pricing models and profiles, and comparing the respective outcomes in payout.

A. SUMMARY OF SIMULATED SYSTEM DESIGN OPTIONS

The alternatives simulated can be defined in terms of four primary factors: (1) type of specialty differentiation; (2) type of geographical differentiation; (3) the inclusion or exclusion of individual physicians' customary charges as first level screens; and (4) the statistical parameter used in derivation of prevailing charges (75th percentile of physicians' billed charges versus the average allowed charge). Options also were included to examine effects of: (5) inclusion or omission of the economic index; and (6) the Talmadge amendment. The large number of

possible combinations across all possible variations of these parameters precludes the practical feasibility of a complete factorial design. Hence, the study concentrates only on selected parametric variations and interactions.

Table 6-1 summarizes the alternatives to be simulated on Medicare data with respect to the various parameters identified above. The first nine options employ a 75th percentile calculation of prevailing (Level II) charges and include application of the economic index. Options 10 through 12 are analogous to 7 through 9, with the exception that average allowed charge is used as the basis for computing prevailing fee screens instead of using the 75th percentile. Options 13 and 14 are the same as 6 and 1, respectively, but without use of the economic index restraints on the prevailing charges. Option 15 is the same as option 1, modified to incorporate the Talmadge amendment provision.

Options 1 through 6 can be recognized as a collection of UCR alternatives. Given two alternative approaches for treating area differentiation (no area recognition vs. current charge class areas), and three alternatives for dealing with physician specialties (no recognition of specialty, recognition only at broad class levels, or recognition at specific specialty level), options 1 through 6 provide a complete factorial treatment of the specified variations on the two parameters for area and specialty recognition in a UCR environment with indexing. Option 1 corresponds to the system design currently in use in Pennsylvania.

Options 7 through 9, providing no level I screen, are tantamount to fee schedule approaches with a schedule of fees based upon 75th percentile fees. They would be, respectively: a statewide fee schedule (recognizing

TABLE 6-1. SUMMARY OF DESIGN OPTIONS

OPTION NO.	SPECIALTY RECOGNITION	GEOGRAPHIC AREAS	CUSTOMARY SCREENS	SPECIAL FEATURES
1	All Specialties	Current 4 Areas	Yes	Current System
2	Broad Classes	Current 4 Areas	Yes	
3	None	Current 4 Areas	Yes	
4	All Specialties	Statewide	Yes	
5	Broad Classes	Statewide	Yes	
6	None	Statewide	Yes	
7	None	Statewide	No	FS at 75th percentile
8	Broad Classes	Statewide	No	FS at 75th percentile
9	None	Current 4 Areas	No	FS at 75th percentile
10	None	Statewide	No	FS at Avg. All'd. Chg.
11	Broad Classes	Statewide	No	FS at Avg. All'd. Chg.
12	None	Current 4 Areas	No	FS at Avg. All'd. Chg.
13	None	Statewide	Yes	Without MEI
14	All Specialties	Current 4 Areas	Yes	Without MEI
15	All Specialties	Current 4 Areas	Yes	Talmadge Amendment

differences in neither area nor specialty); a broad specialty fee schedule (recognizing specialty class, but not area differences); and a sub-state regional fee schedule (recognizing area, but not specialty, differences). Again, the environment includes economic indexing. Options 10 through 12 are precisely analogous to options 7 through 9, respectively; however, the fee schedule would be based upon average allowed charges.

Option 13 (in comparison with option 6) will permit assessment of the indexing feature in a UCR environment where there is no area or specialty recognition. Option 14 (in comparison with option 1) will provide a basis for assessing the effects of indexing in an environment such as that currently operating in Pennsylvania. Option 15 (in comparison with option 1) permits assessment of the effects of introducing the Talmadge limitation into the current Pennsylvania environment.

B. STATISTICAL SUMMARIZATION OF SIMULATED OUTCOMES

Statistics generated from the simulation are designed to reflect the volumes and distributions of payouts and various other effects of the alternatives. These statistics include: (1) total allowed charges; (2) percentages of line items allowed in-full and at 80 percent or more of the billed amounts; (3) means and standard deviations of amounts allowed per service; and (4) beneficiary liability as a percentage of total amount billed. Beneficiary liability is estimated as 20 percent of the allowed charge for assigned claims, and at 20 percent of the allowed charge plus the difference between the billed and allowed amount on non-assigned

claims. There is no accounting for deductibles, and no supplemental insurance is assumed.

In addition to an overall response on each of these variables, the distributions of responses are shown for breakdowns over each of the following classification factors:

(1) Physician specialty -- twenty-nine of the more than sixty provider types recognized by Pennsylvania Blue Shield.

(2) County groups defined by major standard economic areas (e.g., Allegheny and Philadelphia Counties; other SMSAs; and other areas).

(3) Five county groups defined according to physician density.

(4) Approximately eight major type of service categories (e.g., surgery, medical care, anesthesia, etc.).

(5) Four classes of doctors, stratified according to Medicare assignment rates in 1975.

(6) Physician age groups (as of 1978).

(7) Physician groups stratified by percentage of 1975 revenues derived from Medicare.

(8) Physician groups stratified according to the percentage of patients treated in 1975 who were Medicare beneficiaries.

(9) Claim totals categorized by the relation of the submitted charge to the respective reimbursement screens (i.e., less than, equal to, or greater than customary and/or prevailing charges).

IV. SIMULATION METHODOLOGY

Following some preliminary data/file preparation, the modeling and simulation of the claims payment process under various specified system design options proceeded in three main stages. First, sets of synthetic profile data containing Level I (Medicare customary) and Level II (Medicare prevailing) charge screens applicable to the options being examined were created. The procedure for developing the synthetic profiles closely paralleled the procedure used in actual practice to create operational profiles. Second, sample claim records were matched against the synthetic profile data. Using decision logic which emulated the decision rules used for pricing claims in actual claims adjudication operations, allowed charge amounts were determined for each matched sample claim record under each of the options. Finally, output data were generated to indicate the effects of the claim payment process under each option.

The data processing software employed for this application was Statistical Analysis System (SAS). The jobs were executed on one of Pennsylvania Blue Shield's IBM 3033 computing systems.

A. DATA BASE

Data used in accomplishing this were extracted from actual history files of claims paid by Pennsylvania Blue Shield as Medicare Part B carrier and under private Blue Shield coverage in Pennsylvania. The simulated payment process was applied to a sample of Medicare claims

incurred and paid in the fourth quarter 1978 (this being roughly mid-year for a profile year running from July 1, 1978 to June 30, 1979). The claims experience base used in calculating the synthetic profiles consisted of combined Blue Shield and Medicare Part B claims incurred in the second and third quarters, 1977. These claims records represented the middle half of the full calendar year 1977 claims base that would be used in actual practice to calculate profiles implemented on July 1, 1978. Thus, the time lag between profile base period and profile implementation period accurately reflects operational practice. The synthetic profiles were based upon claims from only the middle two quarters of the profile base year period since this was far more economical than using the full base year, and still could be expected to produce profiles providing a reasonably close approximation to those that might be obtained from the full year base.

B. DATA CLEANING AND FILE PREPARATION

The initial step created a set of doctor profiles using, insofar as possible, the same procedures normally used to create Medicare B provider charge/allowance profiles. The experience base from which the profiles were to be generated consisted of all Blue Shield and Medicare claims incurred in the second and third quarters of 1977. Since PBS claims are entered in the history database on a paid date basis, it was necessary to look at fourth quarter 1977 data as well to be sure of including the great majority of claims incurred in the previous two quarters. A total of 13.9 million input records were read at this initial step.

Also, since certain types of providers or physician specialties were of no interest to this study, their claims records were excluded. Examples of excluded groups would be low-volume specialties such as pediatric cardiology, or providers in allied health professions such as optometrists and audiologists. All dental specialties were excluded. Podiatrists, chiropractors, and independent laboratories were very purposely retained and included in the study as being of special interest in relation to the Medicare-using population.

Since type-of-service codes used in computing profiles are slightly less specific than those coded on individual claims, certain groups of types of services were collapsed into single categories here. Also, records lacking crucial data regarding Charge Class or Anesthesia Base Unit values were deleted here. This deletion represented only one tenth of one percent of the original input.

At this point each record represented a single claim line item -- i.e., a unit transaction record of one or more instances on a given date of a given type of service and procedure involving a single provider and a single patient-beneficiary. Approximately 7.4 million records were left in the file to be analyzed at this point.

C. LEVEL I (CUSTOMARY) PROFILES

To create the Level I profile records, all of the 7.4 million line item records had to be sorted by doctor number, then by type of service within doctor and by procedure code within type of service. All records for each unique doctor-number/type-service/procedure-code combination then

were collapsed to a single record. The doctor's charge field was replaced by a field containing the doctor's median charge for the type service and procedure code. The allowed charge field was replaced by a field containing the doctor's average allowed charge for the type service and procedure code. Finally, the number of services filed now contained the total number of services reported for the profile period by the given doctor for the type service and procedure code.

The input of 7.4 million line items was at this point collapsed to 560,000 Level I profiles. On average, each profile summarized slightly more than 13 line items of data.

Medians (and later other percentiles) were computed using the empirical distribution function. That is, the percentile is always assigned a value which actually occurs on or immediately below the chosen division point in the distribution. Values are not interpolated when the percentile would normally fall between cases. This is consistent with actual operational practice at Pennsylvania Blue Shield.

In the final step necessary to produce a usable Level I file, profile records representing fewer than three services were deleted (as they would be in an actual Medicare B profile adjustment) as having too great a likelihood of being unrepresentative. Fully 60 percent of the profile records were dropped for this reason.

Before writing the resulting 222,000 Level I profile records to a permanent file, two additional variables were created by grouping existing variables into broader classes. The group classification variables created and inserted at this point reflected broad physician specialty categories and broad type-service categories.

D. LEVEL II (PREVAILING) PROFILES

Six different bases for Level II profiles were considered:

(1) By Type of Service and Procedure Code (2,451 unique screens).

(2) By Broad Specialty, Type Service and Procedure Code (4,720 unique screens).

(3) By Self-Designated Specialty, Type of Service and Procedure Code (9,316 unique screens).

(4) By Charge-Class, Type Service and Procedure Code (6,492 unique screens).

(5) By Broad Specialty, Charge-Class, Type-Service and Procedure Code (11,337 unique screens).

(6) By Self-Designated Specialty, Charge-Class, Type Service and Procedure Code (19,547 unique screens).

Each Set of Level II values was computed in turn and added at the end of all of the Level I records to which it applied. For example, all doctors reporting more than two instances of Type Service 22, Procedure Code 27695 would have added to their profile records an identical set of Level II values as computed using the first method listed above. (Doctors reporting only one or two services of a procedure were deleted in the previous step.) No distinctions would be made for specialty or geographic area in this method. The other five methods employ such stratifications in different combinations and degrees.

The first method Level II computations may be followed step by step as an illustration of the manner in which all six methods operate:

(1) The Level I profile records are sorted by the Level II grouping variables, in this case Type of Service and Procedure Code.

(2) Each profile record is weighted by the number of services it represents.

(3) The mean of the Level I average allowed charge values is computed for each Type-Service/Procedure-Code combination.

(4) The 75th percentile of the Level I median charges is computed for each Type-Service/Procedure-Code value.

(5) The median of the Level I median charges is also computed for this and for the third method.

(6) The number of unique doctors represented for each Type-Service/Procedure-Code group is counted.

(7) For each Type-Service/Procedure-Code a single Level II record is output.

As before, there is a lower limit on the number of records which must be present for a valid series of Level I values. Four or more different providers must be represented in the Level I records which are collapsed to produce a given Level II record. If only two or three doctors are represented in a category for a Level II, then that Level II record is deleted. This is the function of the doctor count variable.

This sequence of steps was performed for each of the six alternatives. At the end, any profile record with fewer than six sets of Level II variables was deleted. (This situation occurs when one or more of the Level II's computed for a record is deleted due to the presence of experience from fewer than four doctors in its input.) This assures that all the Level II alternatives have the same number of cases for analysis. In actual practice, fewer than 1.5 percent of the profile records were dropped for this reason, leaving a set of approximately 219,500 profiles.

The final profile file consisted of sequentially sorted records for each unique doctor-number/type-service/procedure-code combination. Each record contained one set of Level I variables and six sets of Level II variables. These records were ready to be matched to a sample set of line items to simulate the pricing of those line items using various reimbursement models.

E. CLAIMS PRICING AND PAYMENT MODEL

The sample of line item records to be priced consisted of Medicare B claims incurred and paid in 4th quarter 1978. This data was read in and a series of selection and cleaning operations were performed, identical to those which were used on the profile data. The resulting edited file contained approximately 1.3 million claim line items.

The file of valid edited line items first was sorted by doctor number, type service and procedure. Then each of the sample records was matched with the profile record for that doctor number, type service and procedure. Some profiles did not have any corresponding claims, and some

line item records did not have a profile. Consequently, two files were created at this point: one contained line items with matched profile data added, and the second file contained line items which could not be attached to a profile record by doctor number, type service and procedure code.

The second, or rejected, file consisted of doctors with no Level I profile for a given procedure. However, it sometimes is possible (as is done in actual Medicare B pricing) to match these doctors with profiled doctors having the same type service, procedure code, charge class and specialty. In this way Level II values could be assigned for some of the line items in the reject file. Doctors matched in this way have missing value indicators assigned for the three Level I screen variables. This matching procedure increased the size of the file of doctors having profiles by approximately one percent.

No profile could be constructed for 16 percent of the records in the input sample. Thus the sample of records having profiles consisted of about 1.08 million observations. All sample line items with profiles (complete or Level II only) were merged and sorted into a single sequence by doctor number, type service and procedure code.

In order to facilitate comparisons between various cohorts of physicians on the effects of the various charge screen schemes associated with various reimbursement system design options, a number of physician grouping and classification variables were added to the doctors' records.

To provide for the effects of the Medicare Economic Index, the actual Level II screen applied in the "live" operational processing for each record of the sample 1978 claims experience was captured. These actual

Level II values were carried along in the records brought to the simulated pricing and payment process, and were included among the active screens employed for each option in which indexing was to be incorporated. The synthetic Level II screen calculated in this project did not include any indexing effects. The actual 1978 Level II screens, however, had been subjected to indexing procedures for actual operational use in the time frame of the sample experience base. For options in which indexing was to be in effect (all options except 13 and 14), both the synthetic Level II and the actual Level II were applied, with the effective screen being the lesser valued one. The rationale for this is that any option producing a synthetic Level II value greater than the actual Level II still would be constrained by indexing at approximately (if not exactly) the same value as in the actual Level II. On the other hand, if the synthetic Level II value is less than the actual (indexed) Level II, the new effective constraint would be at this lower value.

Each line item in the string of sample claims experience was priced according to each of the fifteen reimbursement system options defined earlier in Section III.A. For each option, the following were computed: (1) allowed charge; (2) percent of doctor's billed charge allowed; and (3) beneficiary liability as a percentage of billed charge. The basic strategy for computing allowed charges was to choose the minimum value in an array consisting of the doctor's actual billed and claimed charge, the Level I charge screen (if applicable), the unindexed synthetic Level II screen for the option, and the indexed actual Level II screen (if required by the option).

The percent of charge allowed was used to generate other variables which group line items by whether they were allowed at less than 80 percent, 80 percent through 99.9 percent, or 100 percent. Line items allowed in full because the charge was less than the screens also were differentiated from line items whose charges were exactly equal to the screens.

V. AGGREGATE FINDINGS

Table 6-2 presents a summary of aggregate simulated payout effects for each of the fifteen system design options. These are payout data for a sample of fourth quarter, 1978 Medicare Part B claims in Pennsylvania. The claims experience base for all options contained a total of $34,971,276 in billed charges, on a total of 1,062,314 claim line items.

In a cursory overall examination of the table data, it can be seen that the greatest payout is from option 8, which is a specialty fee schedule based upon 75th percentile charges. The payout here is 4.5 percent more than under option 1, which represents the current UCR environment in Pennsylvania (four charge class areas and full specialty recognition). Option 14, the current UCR environment without economic indexing, is nearly as great in payout. At 3.9 percent more payout than the current system (option 1), it is second highest. The lowest payouts are associated with the three fee schedule options having the schedule of fee allowances based upon average allowed charges (10 through 12). All three of these are close to one another in payout, but the absolutely smallest is the statewide fee schedule (no area or specialty recognition), having a payout 14.9 percent less than for the current UCR environment represented in option 1.

Option 8 (specialty fee schedule at 75th percentile) also has the greatest percentage of line items paid in full and at 80 percent or more of billed charge. Option 8 pays 55.2 percent in full, and 80.9 percent at 80 percent or more; this compares to 39.3 percent and 73.1 percent, respectively, for the current system (1). Curiously, option 14, which has

TABLE 6-2. SUMMARY OF AGGREGATE SIMULATED PAYOUT EFFECTS

OPTION	TOTAL $ ALLOWED	MEAN ALLOWED CHG/SVC	% CHGS. PAID	% LI ALLOWED IN FULL	% LI ALLOWED 80%	BENEFICIARY LIABILITY
1	$28,515,087	$20.62	81.54%	39.3%	73.1%	21.69%
2	28,439,255	20.56	81.32%	38.9%	72.5%	21.71%
3	28,267,992	20.44	80.83%	37.5%	70.7%	21.81%
4	28,421,522	20.55	81.27%	38.5%	72.4%	21.70%
5	28,381,782	20.52	81.16%	37.9%	71.9%	21.71%
6	28,129,474	20.34	80.44%	36.9%	69.5%	21.77%
7	29,460,819	21.30	84.24%	54.0%	77.4%	21.08%
8	29,787,221	21.54	85.18%	55.2%	80.9%	20.95%
9	26,622,402	21.42	76.13%	54.8%	78.9%	21.12%
10	24,257,544	17.54	69.36%	19.1%	44.4%	22.65%
11	24,441,946	17.67	69.89%	18.0%	47.6%	22.53%
12	24,316,246	17.58	69.53%	17.9%	44.0%	22.73%
13	29,205,998	21.12	83.51%	42.3%	74.5%	21.57%
14	29,622,766	21.42	84.71%	44.5%	77.8%	21.57%
15	28,210,276	20.40	80.67%	35.0%	66.0%	21.76%

the second highest payout, pays only 44.5 percent of line items in full and fails to also be second highest on this performance parameter. In general, the entire group of fee schedule options based upon 75th percentile (options 7, 8 and 9) do best in terms of paying claims in full, with percentages ranging from 54.0 to 55.2 percent. The group of options for fee schedule based upon average allowed charges (options 10, 11 and 12) collectively have the lowest percentages of claims paid in full, ranging from 17.9 percent to 19.1 percent. This same group, as might be expected, also has the smallest percentage of line items paid at 80 percent or more of billed charges.

Beneficiary liability, as might be expected from the preceding findings, is smallest for the comparatively generous option 8 (specialty fee schedule at 75th percentile), and is greatest with the low payout options 10 though 12 (fee schedule based on average allowances). An interesting observation is that the variation on this particular output parameter is extraordinarily slight. Among all the options in the table, the largest beneficiary liability is 22.73 percent and the smallest is 20.95 percent; the largest is 4.8 percent greater than the beneficiary liability shown for the current Pennsylvania UCR system (option 1), and the smallest is 3.4 percent less. The range of variability on beneficiary liability is thus quite narrow.

The output parameters for "mean allowed charge" and "percent of charges paid" are directly proportional to the total dollars allowed, and show exactly the same relationships between options.

A. IMPACT OF SPECIALTY DIFFERENTIATION

The following pairs of options may be compared to examine effects of recognizing, or not recognizing, specialties. In each pairwise comparison, all system design parameters are the same for both options in the pair, except for the difference in specialty differentiation.

(1) Options 6 and 5, respectively, have no specialty recognition and broad specialty recognition. Both are in a UCR environment with no area differentiation.

(2) Options 6 and 4, respectively, have no specialty recognition and all specialty recognition. Both are in a UCR environment with no area differentiation.

(3) Options 3 and 2, respectively, have no specialty recognition and broad specialty recognition, in a UCR environment with differentiation between four charge class areas.

(4) Options 3 and 1, respectively, have no specialty recognition and all specialty recognition, in a UCR environment with differentiation between four charge class areas.

(5) Options 7 and 8, respectively, have no specialty recognition and broad specialty recognition, in the environment of a fee schedule based upon 75th percentile, with no area differentiation.

(6) Options 10 and 11, respectively, have no specialty

recognition and broad specialty recognition, in the environment of a fee schedule based upon average allowed charges, with no area differentiation.

In all of the above pairwise comparisons between options differing only by specialty differentiation, specialty differentiation is seen (Table 6-2) to increase payout by proportions in the neighborhood of one percent or less. The difference between recognizing all specialties or recognizing only four broad classes of specialties (in a UCR environment) is extremely small.

The percent of line items paid in full increases with specialty recognition, but the difference is less than two percentage points in any of the applicable pairwise comparisons. The percentage of line items paying at least 80 percent of billed charge also increases, but again by relatively little.

Changes in beneficiary liability are in the neighborhood of 0.1 percent or less.

B. IMPACT OF AREA DIFFERENTIATION

The following are pairs of options in which all system design parameters are identical, except for the area differentiation parameter. Pairwise comparison in each case isolates the effect of recognizing area differences.

(1) Option 6 is statewide, without area differentiation, and option 3 recognizes four charge class areas. Both otherwise constitute a UCR environment with no specialty differentiation.

(2) Option 5 is statewide and option 2 recognizes four charge class areas. Both are in a UCR environment with broad specialty recognition.

(3) Option 4 is statewide and option 1 has four charge class areas. Both are in a UCR environment with full specialty recognition.

(4) Option 7 is statewide and option 9 has four charge class areas, in a 75th percentile fee schedule environment with no specialty differentiation.

(5) Option 10 is statewide and option 12 has four charge class areas, in a fee schedule environment based on average allowed charge, with no specialty differentiation.

In most of the pairwise comparisons above, total payout increases by very small amounts (ranging from 0.2 percent to 0.5 percent) with area differentiation.

The difference brought about by area differentiation upon percent of line items paid in full is in the neighborhood of one percentage point or less on all pairwise comparisons of options. The differences in percent of line items paid at least 80 percent also are slight, ranging from 0.4 to 1.5 percentage points.

Again, the differences for beneficiary liability are negligible

C. FEE SCHEDULE OPTIONS

The following six pairwise comparisons examine the differential effects of two kinds of fee schedule options, each relative to a corresponding UCR design.

(1) Option 6 and option 7 represent UCR and 75th percentile fee schedule designs, respectively, in which neither specialty nor area are recognized.

(2) Options 5 and 8 represent UCR and 75th percentile fee schedule designs, respectively, where there is recognition of broad specialty groups, but not of area.

(3) Options 3 and 9 represent UCR and 75th percentile fee schedule designs in which there is area, but not specialty, differentiation.

(4) Options 6 and 10 represent UCR and average charge fee schedule designs in which neither area nor specialty is recognized.

(5) Options 5 and 11 represent UCR and average charge fee schedule designs in which broad specialty group, but not area, is recognized.

(6) Options 3 and 12 represent UCR and average charge fee schedule designs in which there is area, but not specialty, differentiation.

In all three cases where a fee schedule based upon average allowed charge was tested, the fee schedule design had a total payout approximately 14 percent smaller than the corresponding UCR option. These same fee schedules pay roughly 18 or 19 percent of line items in full, compared to 37 or 38 percent paid in full under corresponding UCR options. They pay 80 percent or more of charges on 44 to 48 percent of line items, compared to the same performance on roughly 70 percent of line items under the corresponding UCR options.

Payouts for the 75th percentile fee schedule are approximately five percent higher than corresponding UCR options for designs in which broad specialty is recognized (but not area), and for designs in which neither specialty nor area is recognized. For the design which recognizes area, but not specialty, the 75th percentile fee schedule has a payout level close to six percent lower than the UCR option. This fee schedule pays 54 to 55 percent of line items in full, and pays close to 80 percent of line items at 80 percent or more of billed charges.

Applicable differences in beneficiary liability are slight in all cases.

D. EFFECT OF INDEXING

Option 1 corresponds to the current UCR system in Pennsylvania, with recognition of all specialties and four geographic charge class areas, plus economic indexing. Option 14 describes exactly the same design, but without indexing. Comparing the two, it is seen (Table 6-2) that indexing apparently has reduced payout by approximately 3.7 percent. The results

also show 44.5 percent of line items paid in full, and 77.8 percent paid at 80 percent or more of billed charges, without indexing. The corresponding percentages with indexing are 39.3 percent and 73.1 percent. Indexing would appear to cause approximately 0.1 percentage point increase in beneficiary liability.

A comparison of option 6 with option 13 similarly provides a test of the effect of indexing in a UCR environment with no area or specialty differentiation. The effects are nearly identical to those observed above for the current Pennsylvania UCR environment. Indexing appears to reduce total payout by 3.7 percent. The proportions of line items paid in full and paid at a level of at least 80 percent of billed charges each are reduced by approximately five percentage points. Without indexing, 42.3 percent of line items are paid in full, and 74.5 percent are paid at 80 percent or more of billed charge. With indexing, 36.9 percent are paid in full, and 69.5 percent are paid at least 80 percent of billed charge. Beneficiary liability again is negligibly impacted.

E. EFFECT OF PROPOSED TALMADGE AMENDMENT

Option 15 represents the current Pennsylvania UCR system, but also incorporating the Talmadge amendment provision limiting fee increases to not more than one-third above the statewide median fee. Effects attributable to the Talmadge provision may be estimated by comparing this option to option 1.

In doing so, it is seen (Table 6-2) that the Talmadge provision reduced the simulated payout by 1.1 percent. The percent of line items

paid in full has been reduced from 39.3 percent to 35.0 percent and the proportion paid at 80 percent or better has been reduced from 73.1 to 66.0 percent. The corresponding increase in beneficiary liability is negligible.

VI. DISTRIBUTIVE EFFECTS

Detailed data concerning distributive effects associated with each of the simulated options are presented in an extensive set of tables included as an appendix to this Part Six report. The Appendix tables show distributive effects for breakdowns by: (1) specific physician specialties (or other types of providers); (2) broad generic types of services; (3) major metropolitan, lesser metropolitan, or rural areas; (4) counties grouped according to density of direct patient care physicians; (5) physician age groups; (6) physicians grouped according to number of different Medicare patients seen; (7) physicians grouped according to percent of revenue derived from Medicare Part B, relative to total revenues from Blue Shield and Medicare combined; and (8) physicians grouped according to percent of Medicare line items taken on assignment. For each breakdown, there is a set of five tables displaying: (1) total line items and billed charges, plus allowed charges for each option; (2) aggregate percentage of billed charges allowed for each option; (3) proportion of line items paid in full under each option; (4) proportion of line items on which the allowed charge is at least 80 percent of the billed charge, for each option; and (5) beneficiary liability under each option, expressed as a percentage of the total billed charge.

Beneficiary liability here is defined as consisting of 20 percent of all allowed charges, plus the difference between billed and allowed charges on all unassigned line items. Beneficiary liability thus is slightly understated in all cases, since annual deductibles are not taken into account. Further, no consideration is given to the possibility that

beneficiaries may have complementary insurance coverage for their cost sharing obligations under Medicare Part B.

Three final tables in the Appendix show the volumes and percentage distributions of claim line items, billed charges, and allowed charges for which the billed charges on line items are greater than the reasonable charge screens (GT screen), equal to the applicable screens (EQ screen), or less than the screen (LT screen). "Screen" here is defined to mean the effective screen relative to the adjudication of each claim line item. For the UCR options, this would be the smaller of the applicable Medicare customary and prevailing screens (including indexing, if applicable). For all other options, the only applicable screens are at the prevailing level, operating in effect as a schedule of allowances (either with or without indexing, as may be applicable for given options).

To narrow the findings presented in the Appendix tables to a reasonably concise focus for further discussion in this section, the remainder of the section concentrates only upon selected parts of the Appendix data. Specifically, the discussion will center upon the distributions of allowed charges (and, by implication, upon distributions of percent of billed charges allowed) among specified sub-groups of the physician population, and upon corresponding distributions of beneficiary liabilities. Further, the discussion here will concentrate upon results for options 6, 7, 10, and 14 only -- each taken as a representative of a broad class of options and compared to option 1.

It may be recalled that under option 1, which corresponds to the UCR system currently being used in Pennsylvania, all physician specialties and four different area classifications are recognized, along with economic

indexing. Options 2 through 6 represent alternative UCR system designs different from the current UCR system. Of these various alternative UCR system designs, option 6 differs most markedly from the current UCR system, and for purposes of this discussion is taken as a representative UCR design different from the present system. Specifically, option 6 is a statewide UCR system (UCR/SW) in which the entire statewide physician population is pooled for purposes of developing prevailing charge screens, with no differentiation of geographic areas or physician specialties.

Options 7 through 9 are alternative approaches for a fee schedule based upon 75th percentile charges. Option 7, in which there is no area or specialty differentiation, is taken as a representative 75th percentile fee schedule design (FS/75P).

Options 10 through 12 are alternative approaches for a fee schedule based upon average allowed charges. In the discussion which follows, option 10 is taken as a representative average allowed charge fee schedule (FS/AAC). It will be recalled that this specific option does not recognize area or specialty differences.

Options 6, 7 and 10 all include economic indexing. Option 14 represents an approach like the current Pennsylvania UCR system, except that there is no indexing (UCR/NI).

With this general framework, then, the remainder of this section focuses upon changes in the distributions of allowed charges and beneficiary liabilities that could be associated with a change from the current Pennsylvania UCR system (option 1) to each of these four generally representative system design alternatives. The projected changes are detailed in Tables 6-3 through 6-18 found at the end of the section.

The data in these tables indicate that most specialties would have a slight reduction in allowed charges under a UCR system that pools all physicians statewide and in all specialties. None would be hit extremely hard, and general practice physicians and independent laboratories actually would see a very slight increase in allowed charges. The largest allowed charge reductions, from among the specialties included in the table, would be for obstetrician/gynecologists and for medical specialists in cardiovascular disease and hematology. Under the 75th percentile fee schedule, allowed charges would generally tend to increase for physicians in practically all specialties, with the largest increases being in the neighborhood of five to six percent, and with general and family practitioners included in this group. A fee schedule based upon average allowed charges would produce rather severe allowed charge reductions for nearly all specialties, with only general and family practice physicians showing relatively more modest decreases, and independent laboratories actually increasing 3.8 percent. Removal of indexing from the current UCR system would increase allowed charges for all specialties. Anesthesiologists would gain the most, at a projected increase of 17.3 percent. Allowed charges for most medical and surgical specialists would increase no more than five or six percent. Physicians in primary care would have increases of only slightly more than one percent. In general, the allowed charge impacts of any of the system design changes considered here could be anticipated to be distributed somewhat unevenly to different specialties. Not surprisingly, those who tend to be high priced would lose the most under options that result generally in decreases, and gain the least under options that tend generally to increase allowed charges.

These effects are, of course, reversed for physicians in relatively lower priced specialties (including general practice).

Beneficiary liability would be changed very little in a switch to statewide UCR. Table 6-4 indicates an anticipated increase in beneficiary liability for patients of obstetrician/gynecologists and ophthalmologists of 4.1 percent and 1.6 percent, respectively, and a decrease of 1.7 percent in beneficiary liability for independent lab work. In all other specialties listed here, the change would be one percent or less. With the 75th percentile fee schedule, beneficiary liabilities would tend generally to be reduced. The greatest reductions would be for services of hematologists, podiatrists, and family practice physicians. Beneficiary liabilites for independent lab work actually would increase 2.4 percent. The fee schedule developed on the basis of average allowed charges, on the other hand, would generally increase these liabilities for beneficiaries, with the greatest increases being for services of ophthalmologists, obstetrician/gynecologists, and orthopedic surgeons. Liabilities for services of radiologists would decrease substantially; and liabilities related to services of podiatrists and anesthesiologists would decrease very slightly. The present UCR system without indexing would leave the beneficiary liabilities for patients of general and family practice physicians reduced, but almost negligibly so. The beneficiary liabilities for patients of internists, who also provide a substantial amount of primary care, would be unchanged. Other specialists show a mixed pattern, ranging from increases of 2.1 percent to decreases of 4.5 percent.

Translating this to impacts for generic types of services (Tables 6-5 and 6-6), it can be seen that the anticipated changes in allowed charges

for the statewide UCR option are concentrated in the medical services area, where there is a reduction of 2.5 percent. Under the 75th percentile fee schedule option, allowed charges for surgical services would be increased 4.5 percent. Psychiatric service and pathology allowed charges would be increased even more, but these are relatively lower dollar volume types of service. The average allowed charge fee schedule would produce very significant reductions in all types of service. The smallest reduction would be for pathology, at 6.1 percent. Reductions in other types of service range from 13.1 percent to 20.4 percent. The current UCR system without indexing would increase allowed charges for anesthesia services by 17.4 percent. Medical, psychiatric, and consultation services would be increased relatively modestly.

Impacts upon beneficiary liability by type of service would be uniformly very slight for statewide UCR. With a 75th percentile fee schedule, beneficiary liabilities for radiology services would be increased almost negligibly; and the liabilities would be decreased for all other types of services. The greatest decreases would be for medical, diagnostic medical, and consultation services. With the average allowed charge fee schedule, most types of service show increases in beneficiary liability, ranging up to 5.9 percent for surgery. Radiology, psychiatry, and consultations, on the other hand, show slight reductions. The current UCR without indexing would be predicted to have beneficiary liabilities that are 2.1 percent and 3.4 percent less for surgery and anesthesia services, respectively. All other types of service would show relatively modest or negligible changes.

Tables 6-7 and 6-8 show that the anticipated changes under most design alternatives tend to set major metropolitan areas apart from all other areas with respect to allowed charge impacts, but set lesser metropolitan areas apart from all others in terms of beneficiary liability impact. With statewide UCR or with the average allowed charge fee schedule, the anticipated allowed charge reductions are greatest in major metropolitan areas. The allowed charge increases under the change to a 75th percentile fee schedule would be twice as great in rural and lesser metropolitan areas as in major metro areas. Increases in beneficiary liability under all options except the 75th percentile fee schedule, on the other hand, would be stunningly concentrated in the lesser metropolitan areas, ranging as high as 26.9 percent in these areas.

From some of the remaining tables at the back of this section, it can be seen that allowed charge reductions under the average allowed charge fee schedule would be greatest in localities where there are the greatest supplies of physicians relative to population (Table 6-9). It also can be seen that the corresponding beneficiary liability increases would be greatest for those physicians with the largest numbers of Medicare patients and the largest proportional revenues from Medicare (Tables 6-14 and 6-16). The pattern of projected changes with respect to age-based physician cohorts (Tables 6-11 and 6-12) is consonant with the fact observed in other phases of this project that older doctors have lower prices and younger doctors are relatively more expensive (see Part Three or Part Five of this Final Report series). That is, those with the highest prices tend to be cut back more severely than others under the payout-reducing options, and tend to gain less than others under the

payout-increasing options. Nothing particularly important seems to be evident in the table breakdown by assignment rate.

Intuitively, it may seem that the change in beneficiary liability should always move in the opposite direction from the change in allowed charge for any given option, on the premise that if the insurance program pays the doctor more in relation to his billed charge, the patient-beneficiary should owe less, and vice versa. The tables, however, show several instances in which this is not true. The beneficiary liability sometimes moves in the same direction as the allowed charge, and sometimes in the opposite direction. The explanation for this is that the impact of an allowed charge change on beneficiary liabilities depends on the amount and proportion of assignment acceptance, as well as on the relation between billed and allowed charges in a given physician cohort. If assignment is high, an increase in allowed charges will be accompanied by an increase in beneficiary liability; but the result will be different if assignment falls below a certain point. It can, in fact, be shown that beneficiary liability will increase along with an allowed charge increase if and only if the increase in assigned allowed charges is more than four times the increase in unassigned allowed charges.

To demonstrate this, let:

L = the a priori beneficiary liability;

A_a = total allowed charges assigned;

A_u = total allowed charges unassigned; and

B_u = total billed charges unassigned.

Further, let L', A'_a, A'_u, and B'_u be the analogous quantities under an alternative design option. The beneficiary liability in either case will be 20 percent of the sum of both assigned and unassigned allowed charges, plus the difference between billed and allowed unassigned charges. That is,

$$L = .2(A_a + A_u) + B_u - A_u ;$$

and similarly,

$$L' = .2(A'_a + A'_u) + B'_u - A'_u .$$

Then, for an increase in allowed charges, the liability under the option will be greater than the a priori liability -- i.e., $L' > L$ -- if and only if:

$$.2(A'_a + A'_u) + B'_u - A'_u > .2(A_a + A_u) + B_u - Au$$

which reduces to:

$$A'_a - A_a > 4(A'_u - A'_u) ;$$

i.e., if and only if the increase in assigned allowed charges is more than four times greater than the increase in unassigned charges.

It can be similarly shown that, if there is a decrease in allowed charges, the beneficiary liability will decrease if and only if the decrease in assigned allowed charges is greater than four times the decrease in unassigned allowed charges.

TABLE 6-3. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY SELECTED SPECIALTIES

	UCR/SW	FS/75P	FS/AAC	UCR/NI
General Practice	0.4%	5.9%	- 2.7%	1.5%
Family Practice	0.0%	6.0%	- 6.7%	1.1%
Internal Medicine	-2.0%	3.0%	-18.3%	1.4%
Cardiovascular Disease	-3.6%	-0.5%	-23.1%	2.7%
Hematology	-3.9%	1.3%	-19.9%	5.5%
Medical Oncology	-0.9%	1.9%	-15.8%	5.3%
General Surgery	-1.1%	4.1%	-14.3%	5.1%
Orthopedic Surgery	-1.2%	4.0%	-16.6%	2.8%
Opthalmology	-1.0%	2.8%	-14.4%	6.0%
Proctology	-1.6%	1.7%	-20.1%	6.4%
Urology	-0.9%	3.6%	-13.5%	3.6%
OBG	-3.8%	0.5%	-19.3%	4.6%
Podiatry	-0.1%	5.2%	-10.6%	4.4%
Anesthesiology	-0.1%	0.3%	-18.0%	17.3%
Radiology	-1.3%	5.0%	-16.6%	7.0%
Independent Labs	1.6%	11.0%	3.8%	1.8%

TABLE 6-4. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY SELECTED SPECIALTIES

	UCR/SW	FS/75P	FS/AAC	UCR/NI
General Practice	-0.2%	-5.1%	0.2%	-0.5%
Family Practice	-0.1%	-6.3%	2.5%	-0.3%
Internal Medicine	0.3%	-3.6%	2.8%	0.0%
Cardiovascular Disease	-0.3%	-2.6%	0.8%	0.5%
Hematology	-1.0%	-6.7%	3.5%	-1.8%
Medical Oncology	0.9%	0.7%	0.2%	1.6%
General Surgery	-0.4%	-0.6%	0.1%	0.3%
Orthopodic Surgery	0.7%	-3.1%	8.8%	-0.6%
Opthalmology	1.6%	-3.2%	16.5%	-4.5%
Proctology	0.5%	-1.2%	6.8%	-3.1%
Urology	0.6%	-3.9%	7.7%	-1.0%
OBG	4.1%	1.5%	16.4%	-3.3%
Podiatry	0.0%	-6.8%	-1.3%	1.1%
Anesthesiology	0.0%	-0.5%	-0.5%	-3.2%
Radiology	-0.9%	1.0%	-5.9%	2.1%
Independent Labs	-1.7%	2.4%	2.8%	0.4%

TABLE 6-5. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY TYPE OF SERVICE

	UCR/SW	FS/75P	FS/AAC	UCR/NI
Surgery	0.0%	4.5%	-13.8%	6.0%
Anesthesiology	0.0%	0.4%	-17.8%	17.4%
Radiology	-1.1%	3.8%	-15.9%	7.5%
Medical	-2.5%	2.4%	-16.2%	1.8%
Psychiatric	-0.2%	5.2%	-20.4%	1.1%
Diagnostic Medical	-0.7%	2.7%	-13.1%	2.9%
Pathology	0.6%	6.1%	- 6.1%	5.2%
Consultations	-1.6%	3.8%	-14.5%	1.8%

TABLE 6-6. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM UCR SYSTEM, BY TYPE OF SERVICE

	UCR/SW	FS/75P	FS/AAC	UCR/NI
Surgery	0.1%	-2.7%	5.9%	-2.1$
Anesthesiology	0.0%	-0.4%	5.5%	-3.4%
Radiology	-0.6%	0.3%	-3.1%	1.7%
Medical	1.0%	-3.4%	5.5%	0.1%
Psychiatric	0.0%	-0.6%	-3.7%	0.2%
Diagnostic Medical	-0.4%	-6.1%	1.1%	1.1%
Pathology	-0.6%	-2.2%	3.4%	-1.7%
Consultations	-0.7%	-3.4%	-1.4%	0.5%

TABLE 6-7. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY METROPOLITAN AREA CLASS

	UCR/SW	FS/75P	FS/AAC	UCR/NI
Major Metropolitan	-1.9%	2.4%	-17.0%	4.0%
Lesser Metropolitan	-0.3%	4.8%	-11.9%	3.6%
Rural Areas	-0.8%	4.7%	-10.3%	3.9%

TABLE 6-8. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM UCR SYSTEM, BY METROPOLITAN AREA CLASS

	UCR/SW	FS/75P	FS/AAC	UCR/NI
Major Metropolitan	0.6%	-1.8%	3.9%	-0.5%
Lesser Metropolitan	17.7%	-2.8%	26.9%	15.5%
Rural Areas	-0.9%	-2.8%	-1.1%	1.1%

TABLE 6-9. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PHYSICIAN DENSITY IN LOCALE

Physicians per 100,000	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤75	+0.2%	+5.3%	- 9.5%	+2.7%
75 - 107	+0.5%	+4.9%	-11.7%	+3.6%
108 - 145	+0.3%	+5.5%	-11.1%	+3.7%
146 - 227	+1.1%	+5.1%	-13.9%	+5.8%
≥227	+2.7%	+4.0%	-16.8%	+7.1%

TABLE 6-10. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PHYSICIAN DENSITY IN LOCALE

Physicians per 100,000	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤75	+0.2%	-2.5%	+1.7%	-0.2%
75 - 107	-0.3%	-3.2%	+4.8%	-0.9%
108 - 145	-0.2%	-7.2%	+9.4%	-2.6%
146 - 227	-0.6%	-2.7%	+5.3%	-1.6%
≥227	-0.4%	-1.6%	+0.7%	-0.2%

TABLE 6-11. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PHYSICIAN AGE

Physician Age Group	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 45	-1.4%	2.9%	-16.3%	4.6%
46 - 55	-1.3%	4.1%	-13.4%	3.0%
56 - 65	-1.3%	4.4%	-11.5%	1.9%
≥ 65	-1.5%	4.4%	- 9.8%	1.4%

TABLE 6-12. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PHYSICIAN AGE

Physician Age Group	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 45	-0.1%	-2.3%	2.4%	-0.2%
46 - 55	0.9%	-3.6%	7.6%	-1.3%
56 - 65	1.2%	-4.1%	8.0%	-1.7%
≥ 65	2.5%	-4.4%	10.8%	-0.8%

TABLE 6-13. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY SIZE OF MEDICARE PATIENT ROSTER

Nr. Medicare Patients	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 32	-1.5%	2.7%	-16.7%	4.7%
33 - 89	-1.0%	3.9%	-12.2%	3.0%
90 - 172	-1.0%	4.3%	-10.9%	2.5%
≥ 173	-1.3%	4.0%	-13.6%	3.0%

TABLE 6-14. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY SIZE OF MEDICARE PATIENT ROSTER

Nr. Medicare Patients	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 32	-0.2%	-2.1%	1.3%	0.0%
33 - 89	0.4%	-5.1%	3.6%	-1.5%
90 - 172	0.7%	-4.5%	7.4%	-1.4%
≥ 173	1.2%	-3.2%	8.6%	-1.1%

TABLE 6-15. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PROPORTIONAL REVENUE FROM MEDICARE

Pct. Revenue Medicare	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 25%	-1.5%	2.7%	-16.6%	4.8%
25 - 50%	-0.9%	4.3%	-13.8%	3.5%
51 - 75%	-1.2%	4.3%	-13.1%	2.0%
≥ 75%	-1.4%	3.6%	-13.3%	3.3%

TABLE 6-16. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY PROPORTIONAL REVENUE FROM MEDICARE

Pct. Revenue Medicare	UCR/SW	FS/75P	FS/AAC	UCR/NI
≤ 25%	-0.2%	-2.1%	1.5%	-0.1%
25 - 50%	0.7%	-2.1%	6.6%	-1.4%
51 - 75%	0.9%	-3.5%	7.3%	-1.0%
≥ 75%	1.2%	-4.4%	8.2%	-1.1%

TABLE 6-17. PROJECTED PERCENT CHANGE IN ALLOWED CHARGES DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY ASSIGNMENT RATE

Pct. Line Items Assigned	UCR/SW	FS/75P	FS/AAC	UCR/NI
< 10%	-1.4%	2.9%	-16.0%	4.4%
10 - 50%	-1.0%	4.9%	-11.3%	3.0%
51 - 90%	-1.2%	4.0%	-12.6%	2.4%
> 90%	-1.5%	3.2%	-15.7%	4.1%

TABLE 6-18. PROJECTED PERCENT CHANGE IN BENEFICIARY LIABILITY DUE TO CHANGE FROM CURRENT UCR SYSTEM, BY ASSIGNMENT RATE

Pct. Line Items Assigned	UCR/SW	FS/75P	FS/AAC	UCR/NI
< 10%	0.1%	-3.0%	4.0%	-0.5%
10 - 50%	1.7%	-6.8%	15.6%	-3.1%
51 - 90%	1.0%	-0.8%	5.4%	-1.0%
> 90%	-0.5%	0.3%	-7.3%	1.5%

VII. SUMMARY DISCUSSION

The results of this investigation demonstrated very little net impact assignable to specialty differentiation or to area differentiation within the range of options considered. In general, those changes that do occur are in the direction of slightly increased overall allowed charges when specialties are recognized; and, with one exception, similarly slight increases occur with geographic area differentiation. Overall net changes in beneficiary liability associated with both kinds of differentiation are practically negligible. Unfortunately, all of these specialty or area differentiations were tested in the context of the Medicare Economic Index environment, so that variations in outcome that may have been intrinsically associated with different degrees of area or specialty recognition inevitably were damped. A more faithful test of system responses to area or specialty recognition features would be obtained if the economic indexing feature were omitted entirely from the simulations.

A look was taken at some of the more detailed effects that could be associated with a change from Pennsylvania Blue Shield's present kind of UCR structure -- which recognizes four different classes of areas and many different specialties -- to each of four broadly representative types of alternative system designs. In this, it was found that a change to a UCR system based upon statewide pooling of all doctors in all specialties for reimbursement purposes would reduce allowed charge levels for physicians in nearly every specialty. Characteristically high charging specialties would be impacted the most; and general practitioners actually would see a slight increase in allowed charges. The change to a statewide UCR

system, however, would not have a really great quantitative impact on allowed charges for any specialty. By area, the greatest decreases would be seen in those areas with the highest population density (major metropolitan areas).

Beneficiary liability under statewide UCR would change very little for the patients of physicians in most kinds of specialties. The greatest changes would be increases of 1.6 percent for ophthalmologists' services and 4.1 percent for the services of Obstetricians/Gynecologists. Beneficiary liability for independent labs would decrease 1.7 percent; and all others would decrease by one percent or less. When projected onto broad generic types of service, the beneficiary liability changes are very similar for all types of service. By type of area, however, the beneficiary liability increases far more dramatically in lesser metropolitan areas than in any other kind of area -- 17.7 percent, compared to 0.6 percent increase in major metro areas and a decrease of 0.9 percent in rural areas. Beneficiary liability under a change to statewide UCR also shows the greatest decreases at places where there are the greatest supplies of physicians. The liability is highest for patients of doctors with the largest Medicare patient rosters and for patients of doctors who derive the greatest proportion of their revenues from Medicare. This is significant, of course, because it says that the greatest impact occurs precisely where it touches the greatest number of beneficiaries.

The 75th percentile fee schedule generally increases allowed charge levels, while also tending to decrease beneficiary liabilities. The allowed charge increases here would most benefit general practitioners and

physicians in family practice, with increases of approximately six percent. By area, the benefits of the 75th percentile fee schedule would be greatest for physicians in lesser metro and rural areas, again with allowed charge increases in the neighborhood of six percent. Beneficiary liabilities would be decreased the most for services of general and family practice physicians, and for services of podiatrists. Somewhat smaller, but still fairly sizable, decreases are shown for services of physicans in internal medicine, hematology, orthopedic surgery, ophthalmology, and urology. All of these commonly provide relatively large numbers of services for the elderly population. On the other hand, beneficiary liability increases 2.4 percent for independent labs, and 1.0 percent for radiologist services. In general, beneficiary liability under the 75th percentile fee schedule goes down almost uniformly for all types of service. The greatest decreases are in diagnostic medical services (-6.1 percent), medical and consultation services (-3.4 percent each), and surgery (-2.7 percent).

A fee schedule based upon average allowed charges does not appear on the whole to be a tractable option. While allowed charges are greatly reduced, they probably are reduced to a degree that is too great to be politically feasible. Moreover, beneficiary liability also increases substantially in some cases. Under this option, the allowed charge reductions are quite sizable across all types of service. General practice physicians would have reductions of only 2.7 percent, but other physicians would have allowed charge reductions running from the teens to 23.1 percent. The increases in beneficiary liabilities, by specialty breakdown, would range as high as 16 percent (for patients of

ophthalmologists and Obstetrician/Gynecologists). By type of area, beneficiary liabilities would show their greatest increases in lesser metro areas, at 26.9 percent, compared to an increase of 3.9 percent in major metro areas and a decrease of 1.1 percent in rural areas. Beneficiary liability also would increase most greatly for patients of physicians with the largest number of Medicare patients and the largest proportion of their revenues derived from Medicare.

The current UCR system, without indexing, would allow increases that are moderate on the whole. For general practice, family practice, and internal medicine physicians, the increase in allowed charges would be barely more than one percent. Anesthesiologists are apparently the hardest hit by indexing, with the findings indicating that their allowed charges would rise by approximately 17 percent without indexing. Indexing also appears to have some of its greatest effects upon younger (and more expensive) doctors, and upon doctors who serve relatively few Medicare patients. Beneficiary liability under indexing would be very little affected with respect to services of general practitioners, family practice physicians, and internists. The liabilities would be reduced the most in relation to services of ophthalmologists, proctologists, anesthesiologists, and Obstetrician/Gynecologists, with decreases ranging from 2.1 to 1.7 percent. The liability would be up slightly for services of medical oncologists, podiatrists, and radiologists. This is also generally reflected in the beneficiary liability findings for types of service. Again, the greatest change in beneficiary liability would occur in lesser metropolitan areas, with an increase of 15.5 percent.

(BLANK)

APPENDIX TO PART SIX:

DETAILED TABLES OF FINDINGS

FOR SELECTED DATA BREAKDOWNS

(BLANK)

LIST OF PART SIX APPENDIX TABLES

Table	Title	Page
A- 1	Total Billed Charges, Line Item Volume, and Allowed Charges for Each Option, by Selected Specialties	6- 65
A- 2	Percentage of Billed Charges Allowed for Each Option, By Selected Specialties	6- 70
A- 3	Percent of Line Items Paid in Full Under Each Option, By Selected Specialties	6- 74
A- 4	Percent of Line Items With at Least 80 Percent of Billed Charge Allowed For Each Option, By Selected Specialties	8- 78
A- 5	Beneficiary Liability as Percent of Total Billed Charges for Each Option, by Selected Specialties	6- 82
A- 6	Total Billed Charges, Line Item Volume, and Allowed Charges for Each Option, By Type of Service	6- 86
A- 7	Percent of Billed Charges Allowed for Each Option, By Type of Service	6- 87
A- 8	Percent of Line Items Paid in Full Under Each Option, By Type of Service	6- 88
A- 9	Percent of Line Items With At Least 80 Percent of Billed Charges Allowed, by Type of Service	6- 89
A-10	Beneficiary Liability As Percent of Total Billed Charges for Each Option, By Type of Service	6- 90
A-11	Total Billed Charges, Line Item Volume and Allowed Charges for Each Option, by Metropolitan Area Classification	6- 91
A-12	Percentage of Billed Charges Allowed for Each Option, by Metropolitan Area Classification	6- 92
A-13	Percent of Line Items Paid in Full Under Each Option, by Metropolitan Area Classification	6- 93

Table	Title	Page
A-14	Percent of Line Items With at Least 80 Percent of Billed Charges Allowed, by Metropolitan Area Classification	6- 94
A-15	Beneficiary Liability as Percent of Total Billed Charges for Each Option, By Metropolitan Area Classification	6- 95
A-16	Total Billed Charges, Line Item Volume and Allowed Charges for Each Option, by Physician Density in County of Practice	6- 96
A-17	Percentage of Billed Charges Allowed for Each Option, By Physician Density in County of Practice	6- 97
A-18	Percent of Line Items Paid in Full Under Each Option, By Physician Density in County of Practice	6- 98
A-19	Percent of Line Items With at Least 80 Percent of Billed Charges Allowed, By Physician Density in County of Practice	6- 99
A-20	Beneficiary Liability as Percent of Total Billed Charges for Each Option, By Physician Density in County of Practice	6-100
A-21	Total Billed Charges, Line Item Volume, and Allowed Charges for Each Option by Physician's Age	6-101
A-22	Percentage of Billed Charges Allowed for Each Option, By Physician's Age	6-102
A-23	Percent of Line Items Paid in Full Under Each Option, By Physician's Age	6-103
A-24	Percent of Line Items With at Least 80 Percent of Billed Charges Allowed, by Physician's Age	6-104
A-25	Beneficiary Liabilty as Percent of Total Billed Charges for Each Option, by Physician's Age	6-105
A-26	Total Billed Charges, Line Item Volume and Allowed Charges for Each Option, by Number of Medicare Patients Seen	6-106
A-27	Percentage of Billed Charges Allowed for Each Option, by Number of Medicare Patients Seen	6-107

Table	Title	Page
A-28	Percent of Line Items Paid in Full Under Each Option, By Number of Medicare Patients Seen	6-108
A-29	Percent of Line Items With At Least 80 Percent of Billed Charges Allowed, by Number of Medicare Patients Seen	6-109
A-30	Beneficiary Liability as Percent of Total Billed Charges for Each Option, by Number of Medicare Patients Seen	6-110
A-31	Total Billed Charges, Line Item Volume, and Allowed Charges for Each Option, by Proportional Revenue from Medicare Part B	6-111
A-32	Percent of Billed Charges Allowed for Each Option, By Proportional Revenue from Medicare Part B	6-112
A-33	Percent of Line Items Paid in Full Under Each Option, By Proportional Revenue from Medicare Part B	6-113
A-34	Percent of Line Items With At Least 80 Percent of Billed Charges Allowed, By Proportional Revenue From Medicare Part B	6-114
A-35	Beneficiary Liability as Percent of Total Billed Charges for Each Option, by Proportional Revenue From Medicare Part B	6-115
A-36	Total Billed Charges, Line Item Volume and Allowed Charges for Each Option, by Medicare Assignment Rate	6-116
A-37	Percentage of Billed Charges Allowed for Each Option, by Medicare Assignment Rate	6-117
A-38	Percent of Line Items Paid in Full Under Eeach Option, by Medicare Assignment Rate	6-118
A-39	Percent of Line Items With At Least 80 Percent of Billed Charges Allowed, by Medicare Assignment Rate	6-119
A-40	Beneficiary Liability as a Percent of Total Billed Charges for Each Option, by Medicare Assignement Rate	6-120
A-41	Distribution of Claim Line Items for Each Option, By Relationship of Billed Charge to Charge Screens	6-121

Table	Title	Page
A-42	Distribution of Billed Charges for Each Option, By Relationship to Charge Screens	6-122
A-43	Distribution of Allowed Charges for Each Option, By Relationship of Billed Charge to Charge Screen	6-123

TABLE A-1. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES

	General Surgery	Neurological Surgery	Orthopedic Surgery	Thoracic Surgery	Obstetrics/ Gynecology	Opthalmology
Total Billed Charges	$3,028,022	$320,128	$1,629,868	$927,592	$426,644	$3,563,244
Total # of Line Items	51,897	2,875	28,001	6,165	11,393	42,199
Allowed Charges:						
Option 1	$2,381,269	$225,886	$1,319,075	$741,471	$340,715	$2,894,006
2	2,377,086	222,856	1,314,023	739,885	339,527	2,892,426
3	2,357,243	224,390	1,307,004	739,142	333,835	2,861,522
4	2,380,344	225,808	1,306,942	741,014	339,359	2,894,311
5	2,374,725	223,963	1,310,930	740,881	336,309	2,889,390
6	2,355,377	224,648	1,303,562	739,480	327,832	2,864,053
7	2,479,404	230,332	1,371,929	774,932	342,429	2,974,154
8	2,502,287	229,541	1,383,584	776,732	353,150	3,013,841
9	2,482,703	230,062	1,376,485	773,571	349,926	2,970,870
10	2,042,629	193,504	1,099,671	623,722	274,782	2,475,811
11	2,065,488	190,103	1,110,672	627,865	280,522	2,514,156
12	2,047,574	193,174	1,102,878	621,567	277,818	2,480,469
13	2,466,833	258,083	1,343,916	767,798	339,014	3,026,741
14	2,503,588	265,983	1,355,931	780,594	356,341	3,068,307
15	2,354,242	223,884	1,304,719	739,918	329,505	2,867,641

TABLE A-1. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Otolaryngo-rhinology	Opthal-Oto laryngorhinology	Proctology	Urology	Internal Medicine
Total Billed Charges	$581,684	$75,345	$224,107	$2,125,792	$8,064,769
Total # of Line Items	17,948	2,303	3,936	37,290	284,164
Allowed Charges:					
Option 1	**$452,688**	**$63,933**	**$180,637**	**$1,729,100**	**$6,740,628**
2	**452,462**	**64,114**	**179,028**	**1,724,539**	**6,735,789**
3	**449,705**	**63,472**	**178,697**	**1,715,694**	**6,651,296**
4	**452,123**	**64,052**	**179,592**	**1,718,351**	**6,725,488**
5	**454,880**	**64,142**	**178,080**	**1,720,327**	**6,723,034**
6	**450,185**	**64,067**	**177,804**	**1,713,148**	**6,603,439**
7	475,684	66,242	183,617	1,790,482	6,934,398
8	482,707	66,331	184,065	1,800,270	7,110,643
9	473,873	65,436	184,738	1,794,159	6,999,326
10	385,836	56,792	144,368	1,495,687	5,508,668
11	395,604	59,254	148,866	1,501,774	5,798,632
12	390,798	56,253	145,907	1,494,161	5,513,573
13	470,920	66,444	181,930	1,775,253	6,683,437
14	475,416	66,443	192,120	1,791,247	6,837,189
15	448,336	63,932	180,007	1,718,095	6,659,373

TABLE A-1. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Cardiovascular Disease	Gastro-enterology	Neurology	Psychiatry-Neurology	Anesthes-iology	Dermatology
Total Billed Charges	$2,016,530	$576,247	$342,739	$385,781	$715,501	$183,692
Total # of Line Items	53,591	11,911	7,075	6,538	6,459	9,078
Allowed Charges:						
Option 1	**$1,696,201**	**$493,026**	**$291,583**	**$314,417**	**$512,710**	**$150,955**
2	**1,678,526**	**488,450**	**285,052**	**313,766**	**512,443**	**150,832**
3	**1,664,094**	**485,662**	**274,836**	**313,292**	**512,345**	**149,811**
4	**1,695,374**	**489,823**	**289,630**	**313,698**	**512,703**	**150,697**
5	**1,678,234**	**486,711**	**279,951**	**312,769**	**512,548**	**151,502**
6	**1,635,190**	**478,668**	**263,212**	**311,709**	**512,143**	**150,834**
7	1,687,960	498,169	268,974	329,067	514,246	158,545
8	1,746,767	509,977	288,098	330,159	514,723	159,203
9	1,723,517	509,894	281,941	330,770	514,451	157,119
10	1,304,814	402,968	204,505	250,640	420,575	131,077
11	1,362,219	409,848	219,820	254,280	420,756	137,492
12	1,333,472	406,380	209,622	252,842	419,628	132,176
13	1,657,893	486,857	265,572	317,833	600,447	152,473
14	1,741,256	501,815	301,524	316,918	601,267	152,368
15	1,668,692	482,706	273,559	303,899	512,362	150,108

TABLE A-1. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Radiology	General Practice	Family Practice	Podiatry	Chiropractic	Endo-crinology
Total Billed Charges	$1,877,187	$3,147,137	$1,422,975	$763,959	$38,361	$128,048
Total # of Line Items	65,731	174,736	77,275	39,788	3,314	4,829
Allowed Charges:						
Option 1	**$1,495,723**	**$2,584,366**	**$1,200,270**	**$627,543**	**$32,257**	**$100,944**
2	**1,493,745**	**2,585,564**	**1,181,641**	**627,321**	**32,257**	**100,068**
3	**1,494,606**	**2,596,410**	**1,197,767**	**627,179**	**32,257**	**99,196**
4	**1,478,194**	**2,584,992**	**1,186,827**	**625,617**	**32,032**	**100,602**
5	**1,476,572**	**2,585,566**	**1,182,775**	**626,261**	**32,032**	**99,492**
6	**1,476,029**	**2,596,700**	**1,200,109**	**626,873**	**32,032**	**98,009**
7	1,558,078	2,738,063	1,272,467	660,460	33,715	102,678
8	1,556,150	2,722,250	1,240,467	659,718	33,715	105,078
9	1,575,547	2,737,769	1,269,706	660,854	33,979	104,766
10	1,248,232	2,513,595	1,120,490	561,227	28,183	82,925
11	1,244,109	2,291,337	1,009,015	563,178	28,077	87,979
12	1,256,698	2,500,112	1,109,970	561,949	28,910	84,368
13	1,555,597	2,719,906	1,241,387	651,551	33,060	102,534
14	1,600,893	2,623,332	1,213,125	655,195	33,281	111,427
15	1,465,894	2,583,224	1,199,741	621,484	32,115	98,854

TABLE A-1. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Hematology	Medical Oncology	Nephrology	Pulmonary Disease	Rheumatology	Independent Laboratory
Total Billed Charges	$171,076	$142,101	$394,558	$259,579	$201,736	$348,399
Total # of Line Items	7,581	5,371	4,611	7,169	9,657	40,346
Allowed Charges:						
Option 1	$140,549	$111,468	$310,895	$209,228	$162,065	$286,884
2	140,304	114,577	310,109	208,824	161,458	290,001
3	139,140	113,656	307,560	207,582	159,838	291,532
4	139,372	110,850	310,072	204,528	161,249	288,445
5	139,816	113,049	309,745	208,049	160,539	289,840
6	135,034	110,522	306,509	204,657	157,405	291,475
7	142,338	113,631	309,596	212,016	160,849	318,520
8	146,870	116,393	313,073	216,465	164,790	311,153
9	147,364	116,732	310,648	215,609	164,078	318,537
10	112,536	93,847	250,543	172,594	133,132	297,777
11	119,218	98,531	257,108	181,016	136,641	284,785
12	113,101	94,712	252,060	173,707	133,874	298,722
13	139,284	116,733	359,498	211,548	165,838	298,253
14	148,267	117,314	364,836	215,628	170,907	292,088
15	137,061	110,852	308,865	206,596	158,182	286,536

TABLE A-2. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES

	General Surgery	Neurological Surgery	Orthopedic Surgery	Thoracic Surgery	Obstetrics/ Gynecology	Opthalmology	Otolaryngo-rhinology
Option 1	78.63%	70.56%	80.93%	79,93%	79.86%	81.20%	77.82%
2	78.49	69.61	80.62	79.76	79.58	81.17	77.78
3	77.83	70.09	80.19	79.68	78.24	80.31	77.31
4	78.60	70.53	80.18	79.88	79.54	81.23	77.73
5	78.41	66.96	80.43	79.87	78.82	81.09	78.20
6	77.77	70.17	79.97	79.72	76.83	80.38	77.39
7	81.87	71.94	84.17	83.54	80.26	83.47	81.87
8	82.62	71.70	84.88	83.73	82.77	84.58	82.98
9	81.98	71.86	84.45	83.39	82.02	83.38	81.47
10	67.45	60.30	67.46	67.24	64.41	69.48	66.33
11	68.20	59.38	68.14	67.68	65.75	70.56	68.01
12	67.61	60.34	67.66	67.00	65.12	69.61	67.18
13	81.45	80.61	82.45	82.77	79.46	84.94	80.96
14	82.67	83.08	83.19	84.15	83.52	86.11	81.73
15	77.74	69.93	80.05	79.76	77.23	80.48	77.08

TABLE A-2. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Opthal-Oto laryng-orhinology	Proctology	Urology	Internal Medicine	Cardio-vascular Disease	Gastro-enterology	Neurology	Psychiatry-Neurology
Option 1	84.85%	80.60%	81.34%	83.58%	84.11%	85.56%	85.07%	81.50%
2	85.09	79.89	81.12	83.52	83.24	84.76	83.17	81.33
3	84.24	79.74	80.71	82.47	82.52	84.28	80.19	81.21
4	85.01	80.14	80.83	83.39	84.07	85.00	84.50	81.32
5	85.13	79.46	80.93	83.86	83.22	84.46	81.68	81.07
6	85.03	79.34	80.59	81.88	81.09	83.07	76.80	80.80
7	87.92	81.93	84.23	86.12	83.71	86.45	78.48	85.30
8	88.04	82.13	84.69	88.17	86.62	88.50	84.06	95.58
9	86.85	82.43	84.40	86.79	85.47	88.49	82.26	85.74
10	75.38	64.42	70.36	68.31	64.71	69.93	59.67	64.97
11	78.64	66.43	70.65	71.90	67.55	71.12	64.14	65.91
12	74.66	65.11	70.29	68.37	66.13	70.52	61.16	65.54
13	88.19	81.18	83.51	82.87	82.22	84.49	77.49	82.39
14	88.19	85.73	84.26	84.78	86.35	87.08	87.97	84.03
15	84.85	80.32	80.82	82.57	82.75	83.77	79.82	78.78

TABLE A-2. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Anesthesiology	Dermatology	Radiology	General Practice	Family Practice	Podiatry	Chiropractic
Option 1	71.66%	82.18%	79.68%	82.12%	84.35%	82.14%	84.09%
2	71.62	82.11	79.57	82.16	83.04	82.11	84.09
3	71.61	81.56	79.62	82.50	84.17	81.83	84.09
4	71.66	82.04	78.75	82.14	83.40	81.89	83.50
5	71.63	82.48	78.66	82.16	83.12	81.98	83.50
6	71.58	82.11	78.63	82.51	84.34	82.06	83.50
7	71.87	86.31	83.00	87.00	89.42	86.45	87.89
8	71.94	86.67	82.90	86.50	87.17	86.36	87.89
9	71.90	85.53	83.93	86.99	89.23	86.50	88.58
10	58.78	71.36	66.49	79.87	78.74	73.46	73.47
11	58.81	74.85	66.28	72.81	70.91	73.72	73.19
12	58.65	71.96	66.95	79.44	78.00	73.56	75.36
13	83.92	82.87	86.42	87.24	85.29	86.18	80.07
14	84.03	82.95	85.28	83.36	85.25	85.76	86.76
15	71.61	81.72	78.09	82.08	84.31	81.35	83.72

TABLE A-2. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Endocrinology	Hematology	Medical Oncology	Nephrology	Pulmonary Disease	Rheumatology	Independent Laboratory
Option 1	78.83%	82.16%	78.44%	78.80%	80.60%	80.34%	82.34%
2	78.15	82.03	80.63	78.60	80.45	80.03	83.24
3	77.47	81.33	79.98	77.95	79.97	79.23	83.68
4	78.57	81.47	78.01	78.59	78.79	79.93	82.79
5	77.70	81.14	79.56	78.50	80.15	79.58	82.90
6	76.54	78.93	77.77	77.68	78.84	78.03	83.66
7	80.19	83.20	79.96	78.47	81.68	79.73	91.42
8	82.06	85.85	81.91	79.35	83.37	81.69	89.31
9	81.82	86.14	82.15	78.73	83.06	81.33	91.45
10	64.76	65.78	66.04	63.50	66.49	65.99	85.47
11	68.71	69.69	69.34	65.16	69.73	67.73	81.74
12	65.89	66.11	66.65	63.88	66.92	66.36	85.74
13	80.07	81.42	82.15	91.14	81.50	82.21	85.61
14	87.02	86.67	82.56	92.47	83.07	84.72	83.80
15	77.20	80.12	78.01	78.28	79.59	78.41	82.24

TABLE A-3. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY SELECTED SPECIALTIES

	General Surgery	Neurological Surgery	Orthopedic Surgery	Thoracic Surgery	Obstetrics/ Gynecology	Opthalmology	Otolaryngo-rhinology
Option 1	37.0%	38.7%	45.0%	43.3%	46.0%	43.9%	41.9%
2	36.7	34.7	43.9	42.4	45.4	43.4	41.9
3	28.7	35.7	41.4	40.2	39.3	35.9	39.9
4	36.9	38.0	41.6	42.6	45.2	44.2	42.0
5	35.9	34.9	41.1	42.7	38.1	39.8	42.3
6	28.3	35.7	41.1	42.8	35.7	37.1	41.2
7	41.8	44.6	55.8	57.1	46.3	48.8	57.1
8	50.5	43.1	56.4	57.0	48.2	54.6	59.2
9	42.6	43.9	57.3	54.1	51.8	46.7	54.7
10	15.2	12.2	16.4	20.4	22.4	13.0	15.9
11	19.4	11.3	20.8	20.9	22.6	14.8	20.5
12	13.1	11.2	14.1	20.3	22.0	12.6	17.1
13	31.5	45.1	44.6	45.6	39.7	40.0	48.1
14	42.8	56.1	48.6	51.1	54.8	47.7	47.6
15	27.7	32.5	38.9	42.1	31.2	29.0	35.0

TABLE A-3. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Opthal-Oto laryng-orhinology	Proctology	Urology	Internal Medicine	Cardio-vascular Disease	Gastro-enterology	Neurology	Psychiatry-Neurology
Option 1	55.1%	37.4%	49.0%	42.3%	39.5%	40.6%	41.2%	39.0%
2	54.9	37.1	47.9	42.3	37.8	33.2	38.3	37.7
3	54.8	37.1	45.5	40.9	36.5	32.0	30.4	37.4
4	54.4	34.5	45.5	41.2	39.6	38.7	40.0	38.4
5	55.3	37.0	45.3	41.2	38.4	31.6	32.8	36.2
6	55.2	36.8	44.5	39.7	35.3	29.5	28.2	35.9
7	69.2	49.7	57.8	57.2	43.7	42.4	35.9	53.7
8	69.3	49.9	60.2	60.3	48.8	47.1	40.9	54.1
9	67.4	49.9	58.7	58.5	45.8	51.3	37.8	55.1
10	18.4	16.8	20.6	14.6	9.4	9.4	5.0	17.2
11	24.9	23.1	23.0	19.3	10.7	12.2	10.7	17.5
12	13.1	18.8	16.5	14.3	9.1	10.7	4.9	14.3
13	64.2	42.0	47.9	43.0	37.5	33.1	30.5	40.6
14	62.5	45.5	51.6	46.4	45.0	46.0	52.7	42.2
15	47.7	35.4	42.2	37.9	33.6	27.7	26.3	30.0

TABLE A-3. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Anesthesiology	Dermatology	Radiology	General Practice	Family Practice	Podiatry	Chiropractic
Option 1	11.6%	48.1%	25.6%	36.4%	38.1%	50.8%	19.2%
2	11.1	47.9	25.1	36.5	37.1	50.8	19.2
3	11.3	45.9	25.0	36.8	38.3	50.6	19.2
4	11.6	48.1	23.9	36.6	37.4	50.6	19.2
5	11.1	48.1	23.4	36.6	37.4	50.7	19.2
6	11.3	46.3	23.7	36.9	38.3	50.7	19.2
7	12.7	63.4	44.9	57.2	57.9	70.5	38.4
8	12.5	65.4	43.8	56.4	53.4	70.5	38.4
9	12.8	61.5	46.5	57.1	57.7	70.4	38.7
10	5.5	16.1	12.8	29.7	25.3	23.9	12.1
11	6.3	23.7	12.7	17.8	13.6	24.1	12.1
12	5.5	20.0	11.1	27.1	20.8	24.0	10.7
13	25.5	47.8	28.7	46.0	45.0	56.3	37.2
14	26.5	50.1	31.8	39.8	41.2	57.1	37.0
15	11.0	43.6	22.8	36.2	37.1	48.6	19.2

TABLE A-3. PERCENT OF ITEMS PAID IN FULL UNDER EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Endocrinology	Hematology	Medical Oncology	Nephrology	Pulmonary Disease	Rheumatology	Independent Laboratory
Option 1	35.8%	36.8%	13.9%	31.8%	33.4%	39.1%	36.6%
2	33.8	36.5	17.1	31.5	32.3	39.3	38.3
3	32.1	36.5	17.1	30.1	32.2	38.9	39.5
4	35.2	34.3	14.0	31.7	30.3	38.5	37.3
5	31.8	31.3	14.9	30.0	30.7	38.9	36.9
6	31.9	29.7	13.1	28.7	30.2	37.8	39.5
7	41.8	40.8	22.4	32.7	38.1	40.9	69.9
8	42.8	43.0	24.2	34.4	40.0	42.2	61.7
9	44.5	51.7	26.3	33.8	41.2	43.5	69.6
10	16.9	16.8	9.9	6.3	13.3	13.4	41.5
11	18.5	17.0	11.7	6.4	15.0	10.8	33.1
12	19.8	16.3	11.7	6.6	8.4	12.8	41.1
13	39.8	33.8	32.9	54.0	39.1	51.2	46.2
14	46.8	45.9	37.2	67.1	44.4	58.8	41.4
15	32.1	29.2	12.8	25.0	29.4	36.6	36.4

TABLE A-4. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGE ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES

	General Surgery	Neurological Surgery	Orthopedic Surgery	Thoracic Surgery	Obstetrics/ Gynecology	Opthalmology	Otolaryngo-rhinology
Option 1	67.4%	66.2%	70.9%	68.4%	68.1%	72.0%	64.7%
2	66.8	59.8	69.8	67.2	67.1	71.0	64.4
3	64.2	63.1	66.0	67.3	61.1	62.1	63.3
4	67.2	65.2	65.7	67.7	68.3	72.1	63.4
5	64.3	60.2	69.1	67.7	63.1	71.1	65.1
6	62.9	62.6	64.8	67.6	56.0	63.5	63.0
7	71.3	68.5	74.5	76.1	65.4	72.7	76.1
8	73.6	66.3	81.6	76.2	76.1	82.4	79.7
9	72.9	68.9	77.2	75.8	72.6	70.3	76.3
10	35.2	42.0	37.4	48.6	36.5	31.0	35.8
11	38.8	28.3	49.7	50.8	44.9	48.0	53.5
12	33.9	38.5	38.8	48.8	39.3	34.3	42.1
13	68.3	76.2	67.4	71.1	60.2	65.5	67.6
14	75.7	79.7	73.4	72.2	72.5	73.8	69.3
15	60.6	58.2	63.0	67.3	49.6	58.7	58.8

TABLE A-4. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGE ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Opthal-Oto-laryng-orhinology	Proctology	Urology	Internal Medicine	Cardio-vascular Disease	Gastro-enterology	Neurology	Psychiatry-Neurology
Option 1	81.8%	67.5%	75.3%	73.9%	75.9%	72.1%	74.8%	69.4%
2	81.9	67.0	74.5	73.6	71.7	72.3	69.6	68.8
3	81.4	67.2	71.1	70.0	68.7	66.9	63.7	68.3
4	80.8	65.9	72.9	72.9	75.7	71.7	73.6	70.2
5	82.1	67.2	73.1	73.0	69.9	69.2	66.9	69.1
6	82.0	67.1	69.3	68.1	64.0	60.2	54.3	68.9
7	88.4	75.1	75.7	76.7	68.2	65.4	60.1	77.7
8	88.5	75.2	81.3	83.5	78.7	81.0	73.0	77.9
9	87.6	75.1	78.1	79.1	73.9	77.6	69.4	77.1
10	46.7	43.2	38.5	40.4	34.9	28.7	21.2	34.6
11	81.2	49.0	51.6	50.9	37.5	33.9	25.5	35.5
12	51.5	41.1	38.6	39.3	34.2	29.4	23.4	33.3
13	85.1	70.5	72.9	70.6	67.1	62.8	55.3	73.2
14	83.6	76.7	77.6	77.1	80.2	98.2	78.9	72.4
15	80.4	63.0	68.9	66.3	64.7	58.1	53.0	63.4

TABLE A-4. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGE ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Anesthesiology	Dermatology	Radiology	General Practice	Family Practice	Podiatry	Chiropractic
Option 1	35.2%	72.2%	70.2%	76.0%	77.4%	77.9%	81.0%
2	34.9	71.7	69.6	76.1	75.1	77.6	81.0
3	35.1	70.5	69.9	76.7	77.0	77.8	81.0
4	35.2	71.5	69.7	76.1	75.4	77.6	81.0
5	34.9	72.3	69.4	76.2	75.1	77.7	81.0
6	35.1	72.0	69.5	76.7	77.4	77.8	81.0
7	37.2	79.0	80.7	83.7	84.7	84.2	87.5
8	36.9	79.3	80.6	83.1	82.0	84.0	87.5
9	37.2	77.1	80.9	83.7	84.3	84.1	87.5
10	13.0	36.8	30.9	62.2	57.8	58.1	37.5
11	13.2	60.5	30.4	53.0	46.3	57.0	37.5
12	12.5	42.4	32.0	59.7	54.8	58.9	38.7
13	80.3	75.5	75.4	83.5	83.5	84.8	83.7
14	80.9	74.9	78.0	78.1	79.4	85.1	87.8
15	35.1	70.2	68.8	75.9	77.1	75.2	81.0

TABLE A-4. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGE ALLOWED FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Endocrinology	Hematology	Medical Oncology	Nephrology	Pulmonary Disease	Rheumatology	Independent Laboratory
Option 1	66.1%	65.7%	62.4%	69.5%	66.8%	68.5%	77.4%
2	64.2	65.1	70.4	69.0	65.5	68.2	79.8
3	63.3	62.4	70.5	65.5	64.5	64.5	80.6
4	65.2	62.4	62.7	69.5	62.6	68.5	79.6
5	63.6	65.6	60.0	69.2	64.2	65.7	80.0
6	62.8	56.2	56.8	64.7	61.1	63.0	80.6
7	68.5	67.5	61.2	66.9	65.0	67.4	92.1
8	71.5	78.2	65.2	71.4	70.3	71.5	90.0
9	71.3	74.9	74.5	67.5	68.5	70.2	92.1
10	36.3	33.2	22.6	17.5	32.7	27.9	68.7
11	47.0	38.1	35.3	27.9	40.3	33.9	63.6
12	38.9	30.9	24.9	23.9	32.8	24.0	69.5
13	68.9	63.3	59.7	79.3	64.9	75.2	83.2
14	84.9	76.2	70.6	86.1	72.2	80.3	79.6
15	61.2	56.3	60.9	65.0	60.7	59.1	77.2

TABLE A-5. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES

	General Surgery	Neurological Surgery	Orthopedic Surgery	Thoracic Surgery	Obstetrics/ Gynecology	Opthalmology	Otolaryngo-rhinology
Option 1	**19.95%**	**19.31%**	**22.49%**	**20.57%**	**23.41%**	**25.81%**	**22.66%**
2	**19.94**	**19.38**	**22.50**	**20.57**	**23.38**	**25.84**	**22.71**
3	**19.89**	**19.39**	**22.58**	**20.60**	**23.85**	**26.26**	**22.94**
4	**19.94**	**19.30**	**22.59**	**20.59**	**23.51**	**25.80**	**22.73**
5	**19.92**	**19.30**	**22.58**	**20.63**	**23.64**	**25.85**	**22.62**
6	**19.88**	**19.36**	**22.64**	**20.60**	**24.37**	**26.22**	**22.68**
7	19.83	**19.13**	21.79	20.59	23.76	24.99	21.76
8	19.85	19.06	21.68	20.62	22.75	24.33	21.58
9	19.85	19.18	21.73	20.59	23.04	25.03	22.09
10	19.97	19.48	24.46	21.17	27.25	30.08	24.19
11	19.88	19.49	24.28	21.11	26.52	29.36	23.30
12	20.04	19.51	24.50	21.11	26.88	29.99	24.12
13	19.85	20.20	22.52	20.40	23.79	25.04	22.41
14	20.01	20.16	22.35	20.50	22.64	24.66	22.19
15	19.87	19.31	22.59	20.57	24.29	26.16	22.67

TABLE A-5. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Opthal-Oto laryng-orhinology	Proctology	Urology	Internal Medicine	Cardio-vascular Disease	Gastro-enterology	Neurology	Psychiatry-Neurology
Option 1	**25.17%**	**23.07%**	**22.29%**	**21.05%**	**20.58%**	**20.98%**	**20.28%**	**19.28%**
2	**25.05**	**23.05**	**22.28**	**21.04**	**20.58**	**21.32**	**20.57**	**19.31**
3	**25.47**	**23.02**	**22.39**	**21.19**	**20.65**	**21.41**	**20.75**	**19.36**
4	**25.10**	**23.08**	**22.36**	**21.04**	**20.56**	**20.92**	**20.38**	**19.29**
5	**25.03**	**23.17**	**22.31**	**21.05**	**20.51**	**21.19**	**20.58**	**19.34**
6	**25.01**	**23.19**	**22.42**	**21.11**	**20.52**	**21.41**	**20.48**	**19.40**
7	23.42	22.79	21.41	20.30	20.05	20.74	20.09	19.35
8	23.45	22.77	21.24	20.11	19.92	20.49	20.19	19.29
9	24.15	22.62	21.37	20.40	20.11	20.89	20.45	19.30
10	28.91	24.65	24.01	21.64	20.74	22.28	20.18	18.84
11	27.00	24.42	23.77	21.18	20.45	22.03	20.14	18.79
12	29.36	24.54	24.13	21.80	20.95	22.41	20.42	18.72
13	24.61	22.95	22.16	21.05	20.52	21.43	20.49	19.46
14	24.97	22.35	22.06	21.06	20.69	20.97	20.54	19.31
15	25.17	23.18	22.38	21.12	20.59	21.41	20.56	19.20

TABLE A-5. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY SELECTED SPECIALTIES (CONTINUED)

	Anesthesiology	Dermatology	Radiology	General Practice	Family Practice	Podiatry	Chiropractic
Option 1	23.42%	25.83%	18.78%	22.37%	23.03%	21.22%	29.59%
2	23.41	25.91	18.78	22.37	23.16	21.23	29.59
3	23.42	26.24	18.79	22.35	22.97	21.25	29.59
4	23.41	25.78	18.65	22.36	23.25	21.22	29.66
5	23.41	25.86	18.64	22.36	23.26	21.22	29.66
6	23.41	25.84	18.61	22.33	23.00	21.22	29.66
7	23.31	23.88	18.96	21.22	21.58	19.77	26.82
8	23.32	23.92	18.96	21.29	22.24	19.77	26.82
9	23.32	24.40	19.12	21.24	21.56	19.81	26.67
10	23.32	29.60	17.67	22.42	23.61	20.94	35.75
11	24.68	28.23	17.66	23.59	25.18	20.88	35.92
12	24.68	29.74	17.66	22.47	23.82	20.99	34.74
13	24.75	25.52	18.65	22.09	22.65	21.38	27.84
14	22.66	25.45	19.17	22.25	22.97	21.45	27.81
15	23.42	25.90	18.49	22.38	23.04	21.45	29.64

TABLE A-5. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, AS SELECTED SPECIALTIES (CONTINUED)

	Endocrinology	Hematology	Medical Oncology	Nephrology	Pulmonary Disease	Rheumatology	Independent Laboratory
Option 1	**21.15%**	**23.33%**	**20.01%**	**16.69%**	**20.85%**	**24.66%**	**19.48%**
2	**21.62**	**23.36**	**20.45**	**16.70**	**20.99**	**24.77**	**19.25**
3	**21.73**	**23.45**	**20.33**	**16.70**	**21.12**	**25.04**	**19.15**
4	**21.28**	**23.48**	**19.95**	**16.68**	**20.95**	**24.74**	**19.37**
5	**21.54**	**23.14**	**20.51**	**16.66**	**21.07**	**24.89**	**19.27**
6	**21.85**	**23.10**	**20.20**	**16.63**	**21.33**	**25.32**	**19.14**
7	21.60	21.77	20.15	16.73	20.48	24.94	19.94
8	21.31	21.76	20.44	16.77	20.20	24.32	19.83
9	21.42	21.91	20.33	16.82	20.27	24.42	19.95
10	23.69	24.15	20.05	14.77	21.87	28.15	20.03
11	23.04	23.48	20.08	14.85	21.46	27.95	20.06
12	23.57	24.54	20.59	14.79	21.78	28.22	20.09
13	21.87	22.71	20.66	19.19	21.43	24.29	19.06
14	20.94	22.91	20.33	19.19	20.80	22.96	19.55
15	21.76	23.23	19.99	16.68	21.36	25.20	19.47

TABLE A-6. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY TYPE OF SERVICE

	SURGERY	ANESTHESIA	RADIOLOGY	MEDICAL	PSYCHIATRIC	DIAGNOSTIC MEDICAL	PATHOLOGY	CONSULTATION
Total Billed Charges	$10,601,612	$685,618	$2,538,943	$16,112,667	$339,660	$1,899,484	$1,223,462	$1,999,192
Total # of Line Items	81,326	5,539	84,251	631,497	5,561	64,568	162,878	26,309
Allowed Charges:								
Option 1	$8,436,046	$489,124	$2,023,572	$13,368,724	$275,694	$1,621,334	$ 987,042	$1,261,482
2	8,433,429	489,124	2,022,652	13,300,147	275,757	1,614,842	991,475	1,259,693
3	8,431,615	489,124	2,021,303	13,134,324	275,812	1,613,720	994,676	1,255,705
4	8,433,094	489,124	2,003,079	13,302,573	275,019	1,622,417	990,260	1,253,741
5	8,433,230	489,124	2,003,263	13,269,715	275,079	1,614,608	991,115	1,253,362
6	8,433,870	489,124	2,002,125	13,031,696	275,104	1,610,787	993,327	1,241,229
7	8,816,073	490,821	2,099,402	13,688,365	290,187	1,665,578	1,047,493	1,309,421
8	8,814,765	490,821	2,097,927	14,006,025	289,925	1,670,191	1,038,914	1,325,128
9	8,810,763	490,821	2,117,458	13,813,896	290,865	1,668,550	1,048,734	1,327,780
10	7,274,210	402,100	1,702,732	11,199,886	219,399	1,408,386	926,519	1,078,316
11	7,284,892	401,636	1,702,875	11,367,260	221,539	1,411,229	920,032	1,086,415
12	7,278,091	400,998	1,713,044	11,227,712	221,242	1,419,208	927,347	1,081,859
13	8,886,052	575,069	2,119,961	13,347,643	281,701	1,642,598	1,031,080	1,264,924
14	8,938,351	574,000	2,176,182	13,606,672	278,837	1,667,900	1,038,149	1,284,663
15	8,938,351	489,124	1,994,261	13,137,520	266,920	1,618,462	984,791	1,253,148

TABLE A-7. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY TYPE OF SERVICE

	SURGERY	ANESTHESIA	RADIOLOGY	MEDICAL	PSYCHIATRIC	DIAGNOSTIC MEDICAL	PATHOLOGY	CONSULTATION
Option 1	79.57%	71.34%	79.70%	82.07%	81.17%	85.36%	80.68%	84.14%
2	79.55	71.34	79.67	82.54	81.19	85.01	81.04	84.02
3	79.53	71.34	79.61	81.52	81.20	84.96	81.30	83.72
4	79.55	71.34	78.89	82.56	80.97	85.41	80.94	83.63
5	79.55	71.34	78.90	82.36	80.00	85.00	81.01	83.60
6	79.55	71.34	78.86	80.88	80.99	84.80	81.19	82.79
7	83.16	71.59	82.69	84.95	85.43	87.69	85.62	87.34
8	83.15	71.59	82.63	86.93	85.36	87.93	84.92	88.39
9	83.11	71.59	83.40	85.73	85.63	87.84	85.72	88.57
10	68.61	58.65	67.06	69.51	64.59	74.15	75.73	71.93
11	68.71	58.58	67.07	70.55	65.22	74.30	75.20	72.47
12	68.65	58.49	67.47	69.68	65.14	74.72	75.80	72.16
13	83.82	83.88	83.50	82.84	82.94	86.48	84.28	84.37
14	84.31	83.72	85.71	84.45	82.09	87.81	84.85	85.69
15	79.36	71.34	78.55	81.54	78.58	85.21	80.49	83.59

TABLE A-8. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY TYPE OF SERVICE

	SURGERY	ANESTHESIA	RADIOLOGY	MEDICAL	PSYCHIATRIC	DIAGNOSTIC MEDICAL	PATHOLOGY	CONSULTATION
Option 1	40.46%	5.13%	29.30%	38.08%	38.84%	47.77%	46.86%	35.90%
2	40.25	5.13	29.21	37.40	38.95	47.34	47.29	35.69
3	40.40	5.13	29.12	34.98	39.08	47.24	47.95	35.18
4	40.36	5.13	27.79	37.05	38.66	47.23	47.19	35.72
5	40.26	5.13	27.77	36.01	38.70	47.35	47.09	35.69
6	40.47	5.13	27.96	34.18	38.73	47.14	47.85	35.11
7	57.53	5.89	46.49	52.15	57.09	59.22	63.06	52.99
8	57.29	5.89	45.70	54.79	56.36	59.58	60.51	54.08
9	57.35	5.89	47.79	53.25	56.86	59.31	63.05	53.62
10	22.59	3.25	13.03	16.54	18.72	19.17	31.03	17.23
11	21.99	3.25	13.18	15.41	17.98	18.92	29.28	15.83
12	22.34	3.29	11.19	15.43	16.44	17.67	29.52	15.44
13	48.07	19.08	33.23	38.89	42.55	50.26	55.13	41.10
14	48.60	18.76	35.83	41.65	40.57	51.83	56.09	43.86
15	38.71	5.13	27.23	31.95	31.25	47.10	45.73	35.27

TABLE A-9. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY TYPE OF SERVICE

	SURGERY	ANESTHESIA	RADIOLOGY	MEDICAL	PSYCHIATRIC	DIAGNOSTIC MEDICAL	PATHOLOGY	CONSULTATION
Option 1	68.83%	27.80%	71.05%	73.43%	69.43%	82.05%	73.23%	74.32%
2	68.61	27.80	70.92	72.54	69.54	79.19	74.02	73.98
3	68.62	27.80	70.79	69.40	69.70	79.10	74.51	73.66
4	68.49	27.80	70.56	72.12	70.54	81.79	73.97	73.64
5	68.52	27.80	70.58	71.52	70.63	79.12	74.04	73.77
6	68.40	27.80	70.45	67.56	70.89	79.02	74.11	73.06
7	76.57	29,88	80.47	75.28	78.83	82.49	83.14	82.58
8	76.69	29.88	80.61	81.19	78.24	82.78	82.58	83.15
9	76.90	29.88	80.59	77.69	77.67	82.68	83.54	82.95
10	48.14	6.05	33.94	41.59	36.16	59.43	54.42	43.85
11	47.79	6.08	33.80	47.34	36.41	59.26	54.36	37.14
12	48.07	5.87	34.30	41.24	34.89	58.69	53.90	43.24
13	76.28	79.71	75.92	71.91	75.26	82.31	79.04	79.71
14	77.56	79.22	78.12	76.61	72.43	85.65	79.44	78.83
15	66.78	27.80	70.19	65.34	64.43	81.60	72.42	73.45

TABLE A-10. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY TYPE OF SERVICE

	SURGERY	ANESTHESIA	RADIOLOGY	MEDICAL	PSYCHIATRIC	DIAGNOSTIC MEDICAL	PATHOLOGY	CONSULTATION
Option 1	22.23%	23.56%	19.28%	22.05%	19.18%	20.26%	21.22%	20.16%
2	22.24	23.56	19.28	22.10	19.18	20.22	21.15	20.14
3	22.23	23.56	19.29	22.32	19.18	20.20	21.09	20.18
4	22.25	23.56	19.18	22.08	19.17	20.26	21.19	20.07
5	22.25	23.56	19.17	22.11	19.18	20.20	21.16	20.07
6	22.25	23.56	19.17	22.26	19.18	20.18	21.10	20.01
7	21.63	23.47	19.34	21.29	19.07	19.62	20.76	19.48
8	21.64	23.47	19.34	21.00	19.05	19.63	20.76	19.56
9	21.62	23.47	19.45	21.34	19.05	19.62	20.75	19.72
10	23.54	24.86	18.69	23.27	18.49	20.48	21.94	19.88
11	23.57	24.87	18.65	23.02	18.44	20.48	21.79	19.79
12	23.56	24.95	18.68	23.39	18.36	20.63	22.02	19.94
13	21.75	22.80	19.24	22.18	19.24	20.22%	20.74	20.13
14	21.76	22.77	19.60	22.07	19.21	20.48	20.85	20.26
15	22.23	23.56	19.08	22.25	18.96	20.26	21.23	20.11

TABLE A-11. TOTAL BILLED CHARGES, LINE ITEM VOLUME AND ALLOWED CHARGES FOR EACH OPTION, BY METROPOLITAN AREA CLASSIFICATION

	Major Metro	Lesser Metro	Rural
Total Billed Charges	$21,977,711	$8,258,685	$4,734,880
Total Number of Line Items	688,223	231,889	142,202
Allowed Charges:			
Option 1	$17,927,213	$6,806,034	$3,781,841
2	17,888,153	6,789,507	3,761,596
3	17,800,029	6,746,450	3,721,513
4	17,831,062	6,804,408	3,786,052
5	17,802,984	6,802,727	3,776,072
6	17,593,413	6,785,015	3,751,045
7	18,364,516	7,134,975	3,961,328
8	18,636,652	7,163,648	3,986,921
9	18,637,689	5,767,257	3,911,437
10	14,871,565	5,995,111	3,390,869
11	15,000,456	6,030,809	3,410,681
12	15,188,431	5,889,199	3,238,616
13	18,228,149	7,065,726	3,912,124
14	18,641,117	7,052,794	3,928,856
15	17,676,677	6,782,803	3,750,685

TABLE A-12. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY METROPOLITAN AREA CLASSIFICATION

	Major Metro	Lesser Metro	Rural
Option 1	81.56%	82.41%	79.87%
2	81.39	82.21	79.44
3	80.99	81.68	78.59
4	81.13	82.39	79.96
5	81.00	82.37	79.75
6	80.05	82.15	79.22
7	83.55	86.39	83.66
8	84.79	86.74	84.20
9	84.80	69.83	82.60
10	67.66	72.59	71.61
11	68.25	73.02	72.03
12	69.10	71.30	68.39
13	82.93	85.55	82.62
14	84.81	85.39	82.97
15	80.43	82.12	79.21

TABLE A-13. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION BY METROPOLITAN AREA CLASSIFICATION

	Major Metro	Lesser Metro	Rural
Option 1	40.22%	38.33%	36.17%
2	38.83	38.02	35.68
3	38.97	36.59	32.05
4	39.07	38.45	36.15
5	38.13	38.37	36.09
6	37.20	38.17	33.65
7	53.66	56.92	50.97
8	54.84	57.25	53.27
9	55.83	53.86	46.50
10	16.97	21.74	24.81
11	16.07	19.85	24.64
12	18.58	17.25	15.37
13	42.30	44.17	39.19
14	45.67	43.07	41.03
15	34.92	36.80	32.91

TABLE A-14. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY METROPOLITAN AREA CLASSIFICATION

	Major Metro	Lesser Metro	Rural
Option 1	73.41%	75.48%	67.96%
2	73.12	74.72	65.97
3	71.28	73.16	63.86
4	72.22	75.52	67.99
5	71.85	75.31	66.39
6	68.33	74.85	66.36
7	75.98	82.37	76.06
8	80.95	83.26	76.52
9	79.88	80.14	72.33
10	40.95	50.73	50.59
11	44.42	54.12	52.07
12	44.39	45.87	39.34
13	73.01	80.54	72.10
14	78.19	79.32	73.59
15	66.37	73.73	65.80

TABLE A-15. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY METROPOLITAN AREA CLASSIFICATION

	Major Metro	Lesser Metro	Rural
Option 1	21.21%	20.29%	20.29%
2	21.24	20.24	20.24
3	21.30	20.28	20.28
4	21.22	23.82	20.23
5	21.25	23.81	20.19
6	21.33	23.88	20.11
7	20.82	19.72	19.72
8	20.66	19.78	19.78
9	20.73	22.80	20.03
10	22.04	25.75	20.07
11	21.93	25.57	20.02
12	21.92	26.07	20.66
13	21.20	23.45	19.99
14	21.10	23.43	20.52
15	21.31	23.86	20.18

TABLE A-16. TOTAL BILLED CHARGES, LINE ITEM VOLUME AND ALLOWED CHARGES FOR EACH OPTION, BY PHYSICIAN DENSITY IN COUNTY OF PRACTICE

	Direct Patient Care Physicians Per 100,000 Population				
	<75	75-107	108-145	146-227	>227
Total Billed Charges	$3,146,290	$5,354,338	$5,280,486	$8,163,305	$13,026,856
Total Number of Line Items	105,935	162,716	145,217	228,677	419,769
Allowed Charges:					
Option 1	$2,579,021	$4,358,368	$4,390,504	$6,574,091	$10,227,489
2	2,580,715	4,378,571	4,400,310	6,616,454	10,405,733
3	2,582,700	4,380,391	4,399,976	6,627,594	10,430,861
4	2,557,926	4,334,241	4,370,286	6,610,691	10,394,847
5	2,568,169	4,367,989	4,392,750	6,634,247	10,476,100
6	2,582,934	4,379,096	4,401,942	6,646,422	10,504,693
7	2,715,168	4,571,983	4,631,214	6,911,334	10,631,120
8	2,719,451	4,601,549	4,646,013	6,981,787	10,838,421
9	2,680,860	4,598,517	4,598,517	6,969,487	10,840,300
10	2,338,217	3,846,658	3,903,625	5,663,896	8,505,148
11	2,334,614	3,845,433	3,933,713	5,729,699	8,598,487
12	2,236,919	3,774,903	3,837,330	5,752,891	8,714,203
13	2,670,597	4,537,552	4,546,412	6,838,544	10,612,894
14	2,648,223	4,515,541	4,550,758	6,952,403	10,955,841
15	2,573,928	4,360,582	4,388,758	6,580,895	10,306,001

TABLE A-17. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY PHYSICIAN DENSITY IN COUNTY OF PRACTICE

	Direct Patient Care Physicians per 100,000 Population				
	< 75	75-107	108-145	146-227	> 227
Option 1	82.09%	81.79%	83.36%	81.42%	80.64%
2	81.63	81.58	83.19	81.27	80.42
3	81.30	80.95	82.76	80.98	79.80
4	82.09	81.81	83.33	81.19	80.07
5	82.02	81.78	83.33	81.05	79.88
6	81.97	81.40	83.15	80.53	78.51
7	86.30	85.39	87.70	84.66	81.61
8	86.43	85.94	87.98	85.53	83.20
9	85.21	84.66	87.09	85.38	83.22
10	74.32	71.84	73.93	69.38	65.29
11	74.20	71.82	74.50	70.19	66.01
12	71.10	70.50	72.67	70.47	66.89
13	84.88	84.75	86.10	83.77	81.47
14	84.17	34.33	86.18	85.17	84.10
15	81.81	81.44	83.11	80.62	79.11

Table A-18. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY PHYSICIAN DENSITY IN COUNTY OF PRACTICE.

	Direct Patient Care Physicians per 100,000 Population				
	< 75	75-107	108-145	146-227	> 227
Option 1	41.21%	38.54%	39.33%	38.40%	39.51%
2	40.56	38.17	37.01	38.18	39.06
3	39.70	36.60	37.84	37.64	37.17
4	41.01	38.60	39.42	37.73	38.03
5	40.96	38.41	39.41	37.38	36.71
6	41.03	38.03	39.23	36.54	34.91
7	60.23	53.27	61.61	55.77	49.14
8	59.89	53.87	61.90	57.48	50.85
9	56.76	50.24	58.65	58.47	52.67
10	26.21	21.08	24.06	17.14	15.79
11	23.58	19.45	22.80	17.46	14.76
12	17.70	16.49	19.43	18.97	17.29
13	46.97	44.30	44.81	41.43	39.93
14	44.33	43.16	43.95	44.33	45.30
15	39.21	36.57	38.08	34.05	32.94

TABLE A-19. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY PHYSICIAN DENSITY IN COUNTY OF PRACTICE

	Direct Patient Care Physicians per 100,000 Population				
	<75	75-107	108-145	146-227	>227
Option 1	71.36%	72.02%	77.46%	72.74%	72.74%
2	69.90	71.55	76.94	72.25	72.17
3	68.55	69.10	75.55	71.42	69.81
4	71.46	72.13	77.41	72.66	70.81
5	71.30	71.89	77.43	72.18	69.95
6	70.82	70.59	77.18	70.28	65.66
7	79.69	79.26	85.14	78.75	72.66
8	80.95	81.52	85.59	82.18	78.24
9	76.13	77.23	83.11	80.98	77.74
10	55.56	47.94	54.38	42.88	37.54
11	56.98	50.45	58.17	47.72	40.33
12	44.72	43.50	48.75	45.49	41.66
13	78.13	75.93	82.19	74.92	70.24
14	76.81	75.32	80.83	78.37	77.72
15	69.78	68.76	76.16	68.59	63.87

TABLE A-20. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY PHYSICIAN DENSITY IN COUNTY OF PRACTICE

	Direct Patient Care Physicians per 100,000 Population				
	<75	75-107	108-145	146-227	>227
Option 1	21.65%	21.89%	25.40%	21.85%	20.23%
2	21.64	21.82	23.35	21.75	20.18
3	21.65	21.82	25.37	21.74	20.16
4	21.80	22.02	25.58	21.81	20.20
5	21.69	21.83	25.37	21.74	20.17
6	21.70	21.83	25.34	21.73	20.14
7	21.11	21.19	23.56	21.26	19.90
8	21.08	21.03	23.46	21.08	19.79
9	21.35	21.40	23.84	21.16	19.82
10	22.02	22.94	27.79	23.01	20.38
11	21.98	22.78	27.61	22.89	20.29
12	22.44	23.15	28.21	22.87	20.31
13	21.36	21.67	24.72	21.57	20.30
14	21.60	21.69	24.75	21.50	20.27
15	21.71	21.88	25.41	21.79	20.23

TABLE A-21. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION BY PHYSICIAN'S AGE

	Physician Age Group			
	≤ 45	46-55	56-65	≥ 65
Total Billed Charges	$23,923,759	$5,612,427	$3,665,412	$1,769,679
Total # of Line Items	675,301	172,262	136,168	78,583
Allowed Charges:				
Option 1	$19,288,745	$4,608,247	$3,095,938	$1,522,157
2	19,240,885	4,595,935	3,084,319	1,518,116
3	19,120,975	4,571,084	3,068,888	1,507,045
4	19,225,240	4,590,961	3,086,834	1,518,487
5	19,198,378	4,584,408	3,083,250	1,575,747
6	19,023,573	4,549,563	3,056,734	1,409,604
7	19,842,089	4,797,290	3,232,165	1,589,276
8	20,058,396	4,847,929	3,270,123	1,610,773
9	19,942,330	4,827,440	3,252,604	1,600,028
10	16,153,098	3,991,063	2,740,258	1,373,125
11	16,311,457	4,001,336	2,741,267	1,387,886
12	16,187,640	3,996,069	2,753,465	1,379,073
13	19,862,697	4,693,210	3,126,877	1,523,214
14	20,177,422	4,748,157	3,154,135	1,543,052
15	19,073,997	4,067,376	3,067,376	1,505,463

TABLE A-22. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY PHYSICIAN'S AGE

	Physician Age Group			
	≤45	46-55	56-65	≥65
Option 1	80.62%	82.10%	84.46%	86.01%
2	80.42	81.88	84.14	85.78
3	79.92	81.44	83.72	85.15
4	80.36	81.79	84.21	85.80
5	80.24	81.68	84.11	85.65
6	79.51	81.06	83.39	84.73
7	82.93	85.47	88.18	89.80
8	83.84	86.37	89.21	91.02
9	83.35	86.01	88.73	90.41
10	67.51	71.11	74.75	77.59
11	68.18	71.29	74.78	78.42
12	67.66	71.20	75.12	77.92
13	83.02	83.62	85.30	86.07
14	84.34	84.60	86.05	87.19
15	79.72	81.30	83.68	85.06

TABLE A-23. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY PHYSICIAN'S AGE

	Physician Age Group			
	≤45	46-55	56-65	≥65
Option 1	35.97%	41.60%	45.07%	52.46%
2	35.66	41.13	44.42	51.98
3	34.14	39.99	43.34	51.21
4	35.25	40.70	44.38	52.03
5	34.62	39.96	43.85	51.34
6	33.57	39.26	43.03	50.24
7	49.13	57.53	64.18	70.58
8	50.25	58.65	64.98	72.62
9	49.55	58.94	65.44	72.06
10	15.86	19.63	25.75	33.78
11	15.24	18.46	23.44	31.81
12	14.41	18.95	24.70	33.26
13	39.49	44.26	47.53	52.99
14	42.12	46.03	48.23	54.88
15	31.77	37.27	41.00	48.22

TABLE A-24. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY PHYSICIAN'S AGE

	Physician Age Group			
	≤45	46-55	56-65	≥65
Option 1	71.08%	74.72%	77.32%	80.07%
2	70.39	74.35	76.56	79.84
3	68.57	72.44	75.44	77.08
4	70.37	73.93	76.30	79.48
5	69.78	73.65	75.92	79.13
6	67.28	71.22	74.34	76.36
7	74.71	79.63	82.95	85.88
8	78.15	83.52	86.01	89.50
9	76.25	81.15	84.64	87.22
10	39.77	47.39	54.01	60.77
11	42.39	51.03	57.88	66.61
12	38.73	47.13	56.24	61.79
13	73.27	75.07	77.85	78.54
14	76.97	77.99	79.67	81.66
15	65.78	69.68	72.68	73.95

TABLE A-25. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY PHYSICIAN'S AGE

	Physician Age Group			
	≤45	46-55	56-65	≥65
Option 1	20.83%	22.98%	24.13%	24.28%
2	20.84	23.02	24.15	24.33
3	20.88	23.22	24.35	24.67
4	20.81	23.02	24.20	24.37
5	20.82	23.04	24.21	24.42
6	20.80	23.18	24.42	24.88
7	20.35	22.16	23.13	23.21
8	20.32	21.94	22.77	22.58
9	20.45	22.18	23.00	22.92
10	21.32	24.73	26.07	26.91
11	21.24	24.58	25.92	26.53
12	21.44	24.77	26.10	26.69
13	20.70	22.76	23.92	24.63
14	20.79	22.69	23.71	24.08
15	20.82	23.14	24.37	24.75

TABLE A-26. TOTAL BILLED CHARGES, LINE ITEM VOLUME AND ALLOWED CHARGES FOR EACH OPTION, BY NUMBER OF MEDICARE PATIENTS SEEN

	Number of Different Medicare Patients (1975)			
	≤32	33-89	90-172	≥173
Total Billed Charges	$10,299,629	$1,653,055	$3,683,173	$10,335,419
Total # Line Items	551,941	59,728	132,535	318,110
Allowed Charges:				
Option 1	$15,530,465	$1,350,994	$3,051,949	$8,581,679
2	15,494,908	1,345,526	3,042,538	8,556,283
3	15,395,963	1,339,618	3,031,772	8,500,639
4	15,471,653	1,346,435	3,044,089	8,559,345
5	15,450,211	1,345,595	3,037,157	8,548,820
6	15,300,695	1,337,738	3,021,559	8,469,482
7	15,946,665	1,404,030	3,184,146	8,925,977
8	16,124,166	1,414,803	3,204,462	9,043,790
9	16,047,612	1,406,063	3,196,652	8,972,074
10	12,940,771	1,186,409	2,718,586	7,411,778
11	13,088,846	1,169,235	2,684,240	7,499,625
12	12,999,794	1,181,248	2,719,169	7,416,035
13	15,961,665	1,391,767	3,120,850	8,731,717
14	16,264,835	1,391,010	3,127,692	8,839,230
15	15,342,927	1,340,146	3,027,869	8,499,221

TABLE A-27. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY NUMBER OF MEDICARE PATIENTS SEEN

	Number of Different Medicare Patients (1975)			
	≤32	33-89	90-172	≥173
Option 1	80.47%	71.73%	82.86%	83.03%
2	80.29	81.40	82.61	82.79
3	79.77	81.04	82.31	82.25
4	80.17	81.45	82.65	82.82
5	75.34	81.40	82.46	82.71
6	79.28	80.93	82.04	81.95
7	82.63	84.94	86.45	86.36
8	83.55	85.59	87.00	87.50
9	83.15	85.06	86.79	86.81
10	67.05	71.77	73.81	71.71
11	67.82	70.73	72.88	72.56
12	67.36	71.46	73.83	71.75
13	82.70	84.19	84.73	84.48
14	84.28	84.15	84.92	85.52
15	79.50	81.07	82.21	82.23

TABLE A-28. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY NUMBER OF MEDICARE PATIENTS SEEN

	Number of Different Medicare Patients (1975)			
	≤32	33-89	90-172	≥173
Option 1	35.66%	41.80%	41.56%	44.10%
2	35.48	41.12	41.13	43.40
3	33.86	40.33	40.39	42.16
4	34.97	41.17	41.01	43.22
5	34.35	40.62	40.25	42.60
6	33.13	40.11	39.76	41.77
7	48.16	60.23	61.21	59.99
8	49.37	61.14	61.19	61.55
9	48.88	60.64	62.01	60.89
10	15.82	24.85	24.85	21.19
11	15.40	20.86	21.32	20.73
12	14.76	22.21	23.49	20.08
13	39.01	46.40	45.06	46.06
14	42.15	45.89	44.94	48.06
15	31.28	38.94	38.34	39.53

TABLE A-29. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY NUMBER OF MEDICARE PATIENTS SEEN

	Number of Different Medicare Patients (1975)			
	≤32	33-89	90-172	≥173
Option 1	70.33%	75.84%	77.02%	75.89%
2	69.56	75.48	76.44	75.47
3	67.89	74.61	74.62	73.24
4	69.49	75.45	76.75	75.00
5	68.84	75.29	76.35	74.66
6	66.45	74.43	74.05	71.96
7	74.13	81.74	82.23	80.21
8	77.25	83.32	85.48	84.75
9	75.84	82.06	83.20	81.93
10	38.67	55.01	53.90	48.32
11	41.15	55.64	55.10	54.07
12	38.18	53.58	53.51	48.47
13	72.62	79.87	78.05	75.39
14	76.91	78.74	79.14	78.70
15	64.97	73.42	72.64	69.98

TABLE A-30. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY NUMBER OF MEDICARE PATIENTS SEEN

	Number of Different Medicare Patients (1975)			
	≤32	33-89	90-172	≥173
Option 1	2.46%	23.35%	23.64%	23.04%
2	20.46	23.35	23.65	23.09
3	20.48	23.51	23.78	23.31
4	20.45	23.34	23.69	23.07
5	20.44	23.35	23.69	23.11
6	20.41	23.44	23.80	23.32
7	20.04	22.15	22.58	22.31
8	20.04	22.06	22.43	21.96
9	20.14	22.23	22.57	22.27
10	20.73	24.19	25.38	25.03
11	20.67	24.44	25.47	24.67
12	20.81	24.30	25.48	25.08
13	20.34	22.99	23.36	22.99
14	20.46	23.01	23.32	22.79
15	20.43	23.47	23.78	23.26

TABLE A-31. TOTAL BILLED CHARGES, LINE ITEM VOLUME, AND ALLOWED CHARGES FOR EACH OPTION, BY PROPORTIONAL REVENUE FROM MEDICARE PART B

	Percent of Physician Revenue Derived from Medicare B (1975)			
	<25%	26-50%	51-75%	>75%
Total Billed Charges	$19,265,586	$2,708,059	$6,017,387	$6,980,244
Total # of Line Items	546,942	65,045	189,526	260,801
Allowed Charges:				
Option 1	**$15,490,076**	**$2,189,112**	**$5,010,012**	**$5,825,887**
2	**15,455,037**	**2,179,479**	**4,994,809**	**5,809,930**
3	**15,355,771**	**2,171,610**	**4,966,080**	**5,774,532**
4	**15,433,926**	**2,182,316**	**4,996,898**	**5,808,382**
5	**15,412,073**	**2,179,108**	**4,991,873**	**5,798,729**
6	**15,264,206**	**2,170,340**	**4,949,467**	**5,745,461**
7	15,914,379	2,283,066	5,227,068	6,036,306
8	16,087,767	2,296,958	5,289,996	6,112,500
9	16,007,804	2,284,080	5,252,615	6,077,903
10	12,912,702	1,886,962	4,354,937	5,102,943
11	13,064,730	1,884,092	4,382,562	5,110,563
12	12,970,427	1,880,186	4,350,363	5,115,270
13	15,925,734	2,255,192	5,069,641	5,955,431
14	16,230,552	2,266,182	5,109,795	6,016,236
15	15,302,911	2,172,104	4,969,079	5,766,071

TABLE A-32. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY PROPORTIONAL REVENUE FROM MEDICARE PART B

	Physician Revenue Derived from Medicare B (1975)			
	<25%	26-50%	51-75%	>75%
Option 1	**80.40%**	**80.84%**	**83.26%**	**83.46%**
2	**80.22**	**80.48**	**83.01**	**83.23**
3	**79.71**	**80.19**	**82.53**	**82.73**
4	**80.11**	**80.59**	**83.04**	**83.21**
5	**80.00**	**80.47**	**82.96**	**83.07**
6	**79.23**	**80.14**	**82.25**	**82.31**
7	82.61	84.31	86.87	86.48
8	83.51	84.82	87.91	87.57
9	83.09	84.34	87.29	87.07
10	67.02	69.68	72.37	73.11
11	67.81	69.57	72.83	73.21
12	67.32	69.43	72.30	73.28
13	82.66	83.28	84.25	85.32
14	84.25	83.68	84.92	86.19
15	79.43	80.21	82.58	82.61

TABLE A-33. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY PROPORTIONAL REVENUE FROM MEDICARE PART B

	Physician Revenue Derived from Medicare B (1975)			
	< 25%	26-50%	51-75%	> 75%
Option 1	35.67%	41.24%	43.12%	43.52%
2	35.50	40.07	42.62	42.95
3	33.84%	38.92	41.46	42.05
4	34.99	40.14	42.37	42.81
5	34.34	38.95	41.99	42.10
6	33.13	38.95	41.13	41.36
7	48.26	56.84	59.28	61.53
8	49.40	57.11	60.49	62.85
9	48.81	57.19	59.97	62.89
10	15.86	19.37	21.34	24.04
11	15.58	20.26	19.36	21.69
12	14.86	18.25	18.97	23.25
13	38.89	44.34	46.01	46.20
14	42.18	45.27	46.80	47.43
15	31.27	37.63	39.46	39.16

TABLE A-34. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY PROPORTIONAL REVENUE FROM MEDICARE PART B

	Physician Revenue Derived from Medicare B (1975)			
	<25%	26-50%	51-75%	>75%
Option 1	**70.32%**	**72.42%**	**75.19%**	**77.74%**
2	**69.57**	**71.63**	**74.77**	**77.30**
3	**67.86**	**69.91**	**72.84**	**75.34**
4	**69.53**	**71.57**	**74.49**	**77.03**
5	**68.85**	**71.33**	**74.11**	**76.76**
6	**66.43**	**69.76**	**71.67**	**74.28**
7	74.19	78.65	79.79	82.03
8	77.27	81.47	84.29	15.76
9	75.78	79.20	81.56	83.58
10	38.59	46.52	49.01	52.62
11	41.25	49.04	53.94	55.84
12	38.14	45.32	48.65	52.76
13	72.69	74.89	75.09	78.11
14	76.95	75.87	77.52	80.37
15	64.95	68.46	70.17	72.31

TABLE A-35. BENEFICIARY LIABILITY AS PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY PROPORTIONAL REVENUE FROM MEDICARE PART B

	Physician Revenue Derived from Medicare B (1975)			
	<25%	26-50%	51-75%	>75%
Option 1	**20.54%**	**22.49%**	**22.71%**	**23.70%**
2	**20.54**	**22.50**	**22.77**	**23.74**
3	**20.56**	**22.63**	**22.93**	**23.97**
4	**20.53**	**22.54**	**22.75**	**23.72**
5	**20.52**	**22.55**	**22.77**	**23.76**
6	**20.49**	**22.64**	**22.91**	**23.98**
7	20.11	22.02	21.92	22.66
8	20.10	21.88	21.70	22.31
9	20.20	21.98	21.90	22.66
10	20.84	23.97	24.37	25.65
11	20.76	23.85	24.14	25.53
12	20.92	23.99	24.50	25.70
13	20.42	22.29	22.60	23.57
14	20.52	22.18	22.48	23.45
15	20.51	22.60	22.85	23.97

TABLE A-36. TOTAL BILLED CHARGES, LINE ITEM VOLUME AND ALLOWED CHARGES FOR EACH OPTION, BY MEDICARE ASSIGNMENT RATE

	Percent of Line Items on Which Provider Takes Assignment			
	<10%	10-50%	51-90%	>90%
Total Billed Charges	$20,859,907	$3,858,888	$5,188,922	$5,063,558
Total # Line Items	627,077	138,382	168,970	127,885
Allowed Charges:				
Option 1	$16,878,814	$3,217,412	$4,368,276	$4,050,585
2	16,838,634	3,209,831	4,353,295	4,037,495
3	16,731,061	3,188,186	4,327,943	4,020,801
4	16,819,049	3,211,739	4,359,306	4,031,428
5	16,795,759	3,210,764	4,351,672	4,023,588
6	16,390,079	3,184,693	4,315,813	3,989,888
7	17,366,075	3,373,779	4,542,377	4,178,588
8	17,552,672	3,413,154	4,593,351	4,228,044
9	17,461,594	3,383,879	4,535,823	4,221,105
10	14,174,125	2,853,354	3,817,252	3,412,813
11	14,322,613	2,861,094	3,823,060	3,435,178
12	14,225,142	2,851,419	3,803,258	3,436,427
13	17,329,124	3,284,120	4,439,616	4,153,139
14	17,622,351	3,313,002	4,470,820	4,216,594
15	16,681,362	3,191,068	4,331,196	4,006,539

TABLE A-37. PERCENTAGE OF BILLED CHARGES ALLOWED FOR EACH OPTION, BY MEDICARE ASSIGNMENT RATE

	Line Item Assignment Group			
	<10%	10-50%	51-90%	>90%
Option 1	80.92%	83.38%	84.18%	79.99%
2	80.72	83.18	83.90	79.74
3	80.21	82.62	83.41	79.41
4	80.63	83.23	84.01	79.62
5	80.52	83.20	83.86	79.46
6	79.77	82.53	83.17	78.80
7	83.25	87.43	87.54	82.52
8	84.15	88.45	88.52	83.50
9	83.71	87.69	87.80	83.36
10	67.95	73.94	73.57	67.40
11	68.66	74.14	73.68	67.84
12	68.19	73.89	73.30	67.87
13	83.07	85.11	85.56	82.02
14	84.48	85.85	86.16	83.27
15	79.97	82.69	83.47	79.12

TABLE A-38. PERCENT OF LINE ITEMS PAID IN FULL UNDER EACH OPTION, BY MEDICARE ASSIGNMENT RATE

	Line Item Assignment Group			
	<10%	10-50%	51-90%	>90%
Option 1	36.63%	42.84%	45.54%	40.06%
2	36.43	42.25	44.64	39.58
3	34.89	41.23	43.29	38.87
4	35.97	42.48	44.59	38.89
5	35.40	41.86	43.88	38.04
6	34.26	41.43	42.82	37.43
7	50.43	62.47	62.12	51.69
8	51.50	63.28	63.76	52.88
9	50.97	62.83	62.32	54.71
10	17.30	24.76	23.07	16.24
11	16.49	23.47	21.03	15.78
12	16.19	23.14	21.19	15.98
13	39.91	46.13	47.22	43.30
14	42.65	46.87	49.13	44.72
15	32.43	39.43	40.63	35.87

TABLE A-39. PERCENT OF LINE ITEMS WITH AT LEAST 80 PERCENT OF BILLED CHARGES ALLOWED, BY MEDICARE ASSIGNMENT RATE

	Line Item Assignment Group			
	< 10%	10-50%	51-90%	> 90%
Option 1	71.82%	76.43%	77.41%	70.40%
2	71.10	76.07	76.91	69.81
3	69.42	73.89	75.11	67.75
4	71.07	75.86	76.76	69.25
5	70.45	75.87	76.44	68.58
6	68.19	73.77	74.34	64.88
7	75.83	82.83	82.47	72.42
8	78.81	86.62	85.83	78.13
9	77.24	83.63	83.47	76.16
10	41.18	54.57	51.05	40.24
11	43.74	57.60	56.40	43.81
12	40.64	53.68	50.51	41.77
13	74.10	78.01	77.58	68.88
14	77.72	78.73	79.62	75.03
15	66.73	72.27	72.57	62.77

TABLE A-40. BENEFICIARY LIABILITY AS A PERCENT OF TOTAL BILLED CHARGES FOR EACH OPTION, BY MEDICARE ASSIGNMENT RATE

	Line Item Assignment Group			
	<10%	10-50%	51-90%	>90%
Option 1	21.51%	27.58%	21.44%	18.21%
2	21.53	27.71	21.44	18.18
3	21.59	28.03	21.66	18.15
4	21.52	27.68	21.45	18.17
5	21.52	27.71	21.50	18.16
6	21.53	28.04	21.65	18.11
7	20.86	25.70	21.26	18.26
8	20.80	25.18	21.02	18.30
9	20.93	25.66	21.27	18.29
10	22.36	31.88	22.60	16.88
11	22.30	31.60	22.27	16.86
12	22.45	31.96	22.60	16.98
13	21.33	27.09	21.44	18.49
14	21.41	26.73	21.23	18.65
15	21.53	27.96	21.62	18.14

TABLE A-41. DISTRIBUTION OF CLAIM LINE ITEMS FOR EACH OPTION, BY RELATIONSHIP OF BILLED CHARGE TO CHARGE SCREENS

	Number of Line Items			Percent of Line Items		
	GT Screen	EQ Screen	LT Screen	GT Screen	EQ Screen	LT Screen
Option 1	645,162	383,014	34,138	60.7%	36.1%	3.2%
2	649,320	378,949	34,045	61.1%	35.7%	3.2%
3	663,657	365,624	33,033	62.5%	34.4%	3.1%
4	652,880	375,696	33,738	61.5%	35.4%	3.2%
5	659,613	368,755	33,946	62.1%	34.7%	3.2%
6	669,900	359,526	32,888	63.1%	33.8%	3.1%
7	488,547	238,387	335,380	46.0%	22.4%	31.6%
8	476,419	216,759	369,136	44.9%	20.4%	34.8%
9	480,457	240,747	341,110	45.2%	22.7%	32.1%
10	859,816	17,965	184,533	80.9%	1.7%	17.4%
11	870,683	10,190	181,441	82.0%	1.0%	17.1%
12	872,562	9,042	180,710	82.1%	0.9%	17.0%
13	613,065	408,980	40,269	57.7%	38.5%	3.8%
14	589,786	431,962	40,566	55.5%	40.7%	3.8%
15	689,850	339,432	33,032	65.0%	32.0%	3.1%

TABLE A-42. DISTRIBUTION OF BILLED CHARGES FOR EACH OPTION, BY RELATIONSHIP TO CHARGE SCREENS

	Billed Charges			Percent of Billed Charges		
	GT Screen	EQ Screen	LT Screen	GT Screen	EQ Screen	LT Screen
Option 1	$25,822,927	$8,322,221	$ 826,128	73.8%	23.8%	2.4%
2	26,011,544	8,141,471	818,261	74.4	23.3%	2.3%
3	26,331,212	7,842,184	797,880	75.3	22.4%	2.3%
4	26,020,944	8,129,602	820,730	74.4%	23.3%	2.4%
5	26,181,794	7,969,347	820,135	74.9%	22.8%	2.4%
6	26,572,977	7,601,385	796,914	76.0%	21.7%	2.3%
7	22,058,267	5,102,847	7,810,162	63.1%	14.6%	22.3%
8	21,439,750	4,982,484	8,549,043	61.3%	14.3%	24.5%
9	21,665,644	5,274,511	8,031,112	62.0%	15.1%	22.9%
10	31,580,288	249,484	3,141,504	90.3%	0.7%	9.0%
11	31,781,598	142,565	3,047,113	90.9%	0.4%	8.7%
12	31,737,921	136,399	3,096,956	90.8%	0.4%	8.8%
13	24,279,958	9,609,789	1,081,529	69.4%	27.5%	3.1%
14	23,152,898	10,701,891	1,116,487	66.2%	30.6%	3.2%
15	27,039,436	7,133,320	798,519	77.3%	20.4%	2.3%

TABLE A-43. DISTRIBUTION OF ALLOWED CHARGES FOR EACH OPTION, BY RELATIONSHIP OF BILLED CHARGE TO CHARGE SCREEN

	Allowed Charges			Percent of Allowed Charges		
	GT Screen	EQ Screen	LT Screen	GT Screen	EQ Screen	LT Screen
Option 1	$19,366,738	$ 8,322,221	$ 826,128	67.9%	29.2%	2.9%
2	19,479,523	8,141,471	818,261	68.5%	28.6%	2.9%
3	19,627,928	7,842,184	797,880	69.4%	27.7%	2.8%
4	19,471,190	8,129,602	820,730	68.5%	28.6%	2.9%
5	19,592,300	7,969,347	820,135	69.0%	28.1%	2.9%
6	19,731,175	7,601,385	796,914	70.1%	27.0%	2.8%
7	16,547,810	5,102,847	7,810,162	56.2%	17.3%	26.5%
8	16,255,695	4,982,484	8,549,043	54.6%	16.7%	28.7%
9	16,316,769	5,274,511	8,031,121	55.1%	17.8%	27.1%
10	20,866,556	249,484	3,141,504	86.0%	1.0%	13.0%
11	21,252,268	142,565	3,047,113	87.0%	0.6%	12.5%
12	21,082,891	136,399	3,096,956	86.7%	0.6%	12.7%
13	18,514,680	9,609,789	1,081,529	63.4%	32.9%	3.7%
14	17,804,388	10,701,891	1,116,487	60.1%	36.1%	3.8%
15	20,278,325	7,133,320	798,519	71.9%	25.3%	2.8%

(BLANK)

CMS LIBRARY
3 8095 00014758 3